IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Patent Application Ser. No.: 09/466,627 Group Art Unit: 2176

Filing Date: 12/17/1999 Examiner: M. NGUYEN

Attorney Docket Number YO999-429 Inventor Name(s): LO ET AL.

Title: METHOD AND APPARATUS FOR CONVERTING BETWEEN DATA SETS AND XML DOCUMENTS

Commissioner for Patents
P.O. Box 1450
Alexandria VA 22313-1450

DECLARATION OF MING-LING LO, PH.D.

Sir:

I, Ming-ling Lo, Ph.D., hereby declare as follows:

1. I am one of the named inventors in the above-identified application.
2. I have been provided with a copy of the declaration of my co-inventor, Shyh-kwei Chen, Ph.D., dated June 9, 2004; and a copy of the declaration of the project manager, Jen-Yao Chung, Ph.D., dated June 10, 2004.
3. I have reviewed the declarations referred to paragraph 2.
4. Based on this review, my recollection of certain past events is refreshed. I therefore remember that Shyh-kwei Chen and I
   a. Conceived of the idea of establishing a mapping from lists and scalars corresponding to at least one data source into XML elements and attributes during the summer of 1998;

b. Worked at least part time during the fall of 1998 to reduce this invention to practice; and

c. Worked full time reducing this invention to practice during the entire year of 1999.

5. I further declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Ming-Jing Lo, Ph.D.

2006/10/15

Date of signature

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Patent Application Ser. No.: 09/466,627 Group Art Unit: 2176

Filing Date: 12/17/1999 Examiner: M. NGUYEN

Attorney Docket Number YO999-429 Inventor Name(s): LO ET AL.

Title: METHOD AND APPARATUS FOR CONVERTING BETWEEN DATA SETS AND XML DOCUMENTS

Commissioner for Patents
P.O. Box 1450
Alexandria VA 223131-1450

DECLARATION OF JEN-YAO CHUNG, PH.D.

Sir:

I, Jen-Yao Chung, Ph.D., hereby declare as follows:

1. During the years 1998 and 1999, I was manager to Shyh-Kwei Chen and responsible for supervising his project relating to converting database information to XML. I was also familiar with the work of his co-inventor Ming-Ling Lo.

2. Attached as Exhibit A is a copy of an e-mail from Denise Dyko to Kevin Leahy and Michael Swanson dated September 17th, 1998. This e-mail mentions to store and retrieve XML data in current enterprise data formats, and to enable rapid exploitation of existing data in e-commerce XML applications while continuing to support existing applications against that data, relating to this project. This e-mail is a printout from my personal computer and is a business record that I maintain. I therefore trust its accuracy.

3. This e-mail evidences the proposed project which matured into the patent application identified above. Based on this e-mail, I believe that Shyh-Kwei Chen and Ming-Ling Lo conceived of their invention, namely the idea of establishing a mapping from lists and scalars corresponding to at least one data source into XML elements and attributes, during the summer of 1998.

4. Attached as Exhibit B, hereto are three e-mails from Denise Dyko to myself dated September 10th, 1998, from myself to Denise Dyko and Chungti Liang dated September 25th, 1998, and from Denise Dyko to Don Ault, John Thompson, and Eric Porter dated October 13th, 1998. These emails are business records I maintain in my computer and I therefore trust their accuracy. These emails describe the basis for a universal data management architecture, which lead to the funding for the XML Access Server OS/390 project. Confidential information not relating to the present application has been blacked out; however, the information relevant to establishing dates for this application is still visible.

5. Attached as Exhibit C, hereto is an e-mail from Denise Dyko to Gerry Meyer dated November 30th, 1998. This email is a business record I maintain in my computer and I therefore trust its accuracy. This email explains that Shyh-Kwei Chen and Ming-Ling Lo were projected to work full time on the project (2PY) that matured into the present application during all of 1999. Confidential information not relating to the present application has been blacked out; however, the information relevant to establishing dates for this application is still visible.

6. Attached as Exhibit D, hereto are five e-mails from Denise Dyko to Ming-Ling Lo dated December 3rd, 1998, from Denise Dyko to George Zagelow dated December 4th, 1998,

from Denise Dyko to Gerry Meyer dated December 4th, 1998, from Denise Dyko to David Fallside dated December 9th, 1998, and from myself to Denise Dyko dated December 10th, 1998. These emails are business records I maintain in my computer and I therefore trust their accuracy. These emails mention that Shyh-Kwei Chen and Ming-Ling Lo were to present the newly funded XML 390 Access Server project to the XML summit that was held on December 15th and 16th, 1998.

7. Attached as Exhibit E, hereto is a set of presentation slides dated December 15th, 1998. These presentation slides are business records I maintain in my computer and I therefore trust its accuracy. The presentation outlines that Shyh-Kwei Chen and Ming-Ling Lo were to work full time during 1999 on the project that matured into the patent application identified above.

8. Based on the documents identified above, my recollection is refreshed regarding the events of 1998 and 1999. I therefore remember that Shyh-Kwei Chen and Ming-Ling Lo

- conceived of their invention of the idea of establishing a mapping from lists and scalars corresponding to at least one data source into XML elements and attributes during the summer of 1998;
- worked at least part time during the fall of 1998 to reduce this invention to practice;
- worked full time reducing this invention to practice during the entire year of 1999.

7. I further declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Jen-Yao Chung, Ph.D.

June 10, 2004

Date

Exhibit A

Jen-Yao Chung/Watson/IBM
05/27/2004 04:16 PM
This document expires on
05/27/2103

To ShyhKwei Chen/Watson/IBM@IBMUS
cc
bcc
Subject Re: Research Project Funding for XML in OS/390

Denise Y. Dyko 09/17/98 03:33 PM

Denise Y. Dyko 09/17/98 03:33 PM

To: Kevin Leahy/Poughkeepsie/IBM@IBMUS, Michael Swanson/Poughkeepsie/IBM@IBMUS
cc: Jen-Yao Chung/Watson/IBM@ibmus, Denise Gorski/Poughkeepsie/IBM@IBMUS, Michael Oliver/Poughkeepsie/IBM@IBMUS, Bob Schloss/Watson/IBM@IBMUS, ShyhKwei Chen/Watson/IBM@IBMUS, Nancy P Riggs/Watson/IBM@IBMUS, Thomas Rozmus/Poughkeepsie/IBM@IBMUS, Douglas Archer/Poughkeepsie/IBM@ibmus, Chungti Liang/Poughkeepsie/IBM@IBMUS, David Fallside/Santa Teresa/IBM@ibmus, Susan Malaika/Santa Teresa/IBM@IBMUS, Mike Baskey/Poughkeepsie/IBM@IBMUS
From: Denise Y. Dyko/Poughkeepsie/IBM @ IBMUS
Subject: Research Project Funding for XML in OS/390

I met with Jen-Yao Chung, Bob Schloss, and ShyhKwei Chen yesterday in Hawthorne to review what research can best contribute to OS/390's strategy for XML. (Kevin, I'm the focal point for OS/390 XML strategy.) Our discussion resulted in the following project description:

> In addition to storing documents in repositories/databases in XML format, there is a need to store and retrieve XML data in current enterprise data formats, to enable rapid exploitation of existing data in e-commerce XML applications while continuing to support existing applications against that data. This research project will propose techniques and algorithms to manage the automatic composing of XML documents from existing enterprise data, and conversion back to proprietary formats from XML The project will include effective ways to prepare XML documents from multiple enterprise data sources using XML name spaces, and algorithms to combine/merge DTDs. Initial deliverables will include articulation of the OS/390 XML strategy and its validation via proof of concept. The OS/390 division, with research, will also undertake validation with customers and ISVs.

This project definition is aimed at rapid execution of the corporate XML strategy, which sees the value of XML as its enablement of volume growth in e-business, to the point where NT and UNIX platforms cannot scale rapidly enough to compete with OS/390.

I need your help to get this project included in the 390 division's funding of research projects. Would you like me to set up a meeting to review this project definition and OS/390's role in XML in general? With whom should I work to ensure that this project is prioritized with the other work being funded in research?

Cheers, Denise
Lotus Notes Address: Denise Y. Dyko/Poughkeepsie/IBM@IBMUS
VM Address: KGNVMC.DYKO@VM
Internet Address: DYD@VNET.IBM.COM
Phone: (914)435-6903, t/l 8-295-6903

Exhibit B

Jen-Yao Chung/Watson/IBM
05/27/2004 04:17 PM
This document expires on
05/27/2103

To ShyhKwei Chen/Watson/IBM@IBMUS
cc
bcc
Subject Re: XML project proposal and Meeting on Sept. 16, 11am

Denise Y. Dyko 09/10/98 03:50 PM

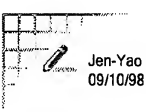
Denise Y. Dyko 09/10/98 03:50 PM

To: Jen-Yao Chung/Watson/IBM@ibmus
cc: ShyhKwei Chen/Watson/IBM@IBMUS, Michael Swanson/Poughkeepsie/IBM@IBMUS, Thomas Rozmus/Poughkeepsie/IBM@IBMUS
From: Denise Y. Dyko/Poughkeepsie/IBM @ IBMUS
Subject: Re: XML project proposal and Meeting on Sept. 16, 11am

Let's start at 1:00, in your office. The project description is excellent. Thank you.

Mike, Jen-Yao feels the project description is the basis for a universal data management architecture. (We're both very enthused about the possibilities.) Is there anyone else you feel should attend this meeting? We'll be identifying specific research activities to support this project.

Cheers, Denise
Lotus Notes Address: Denise Y. Dyko/Poughkeepsie/IBM@IBMUS
VM Address: KGNVMC.DYKO@VM
Internet Address: DYD@VNET.IBM.COM
Phone: (914)435-6903, t/l 8-295-6903



Jen-Yao Chung
09/10/98 03:23 PM

To: Denise Y. Dyko/Poughkeepsie/IBM@IBMUS
cc: ShyhKwei Chen/Watson/IBM@IBMUS
From: Jen-Yao Chung/Watson/IBM @ IBMUS
Subject: XML project proposal and Meeting on Sept. 16, 11am

Hi Denise, can you come down on Sept. 16. I'm free after 11am. We want meet from 11am or 1pm. Please let me know your availability. Thanks. -chung

---

Project: Enterprise Data Management Using XML

- Instead of storing documents to the repositories/databases in XML format, there is still a need for storing enterprise data in current format due to large volume and business issues. We are proposing techniques and algorithms to manage the automatic composing of XML documents from existing enterprise data, and converting back to proprietary formats from XML - We also look for effective ways to prepare XML documents from multiple enterprise data sources using XML name space, and DTD combining/merging algorithms.

Jen-Yao Chung/Watson/IBM
05/27/2004 04:15 PM
This document expires on
05/27/2103

To ShyhKwei Chen/Watson/IBM@IBMUS
cc
bcc
Subject Re: *IBM Confidential: Enterprise Data Management Using XML project detail description

Jen-Yao Chung

Jen-Yao Chung
09/25/98 01:07 PM

To: Denise Y. Dyko/Poughkeepsie/IBM@IBMUS, Chungti Liang/Poughkeepsie/IBM@IBMUS
cc: ShyhKwei Chen/Watson/IBM@IBMUS, Anant Jhingran/Watson/IBM@IBMUS
From: Jen-Yao Chung/Watson/IBM @ IBMUS
Subject: *IBM Confidential: Enterprise Data Management Using XML project detail description

Project Name: Enterprise Data Management Using XML

Project Objective:
In addition to storing documents in repositories/databases in XML format, there is a need to store and retrieve XML data in current enterprise data formats, to enable rapid exploitation of existing data in e-commerce XML applications while continuing to support existing applications against that data.

Previous Work:
XML activities
. Proposed transparent XML/EDI generic translation/transportation/rendering schemes, and generated a proof-of-concept prototype
. Produced document turnaround logic
. Filed two patents on dynamic business process automation system using XML, and automatic XML display script/style sheet and DTD generation
Net.Data OS390 delivery
. Included DB2 connections, national language support, and numerous backend scripts' integration such as REXX, PERL, and compiled-C code etc..
. took part in Beta customer support program

Work Items:
This research project will propose techniques and algorithms to manage the automatic composing of XML documents from existing enterprise data, and conversion back to proprietary formats from XML. The project will include effective ways to prepare XML documents from multiple enterprise data sources using XML name spaces, and algorithms to combine/merge DTDs.

Potential Deliverables:
Initial deliverables will include articulation of the OS/390 XML strategy, proof-of-concept validation tools/programs, and potential patent filing and paper publication. [redacted]

Jen-Yao Chung/Watson/IBM
05/27/2004 04:14 PM
This document expires on
05/27/2103

To ShyhKwei Chen/Watson/IBM@IBMUS
cc
bcc
Subject Re: OE access to OS/390 legacy data stores

Denise Y. Dyko 10/13/98 05:42 PM

Denise Y. Dyko 10/13/98 05:42 PM

To: Don Ault/Poughkeepsie/IBM@ibmus, John Thompson/Poughkeepsie/IBM@IBMUS, Eric Porter/Poughkeepsie/IBM@IBMUS
cc: Jen-Yao Chung/Watson/IBM@ibmus
From: Denise Y. Dyko/Poughkeepsie/IBM @ IBMUS
Subject: Re: OE access to OS/390 legacy data stores

Thank you all for your responsiveness. John, we have defined the following research project related to XML on OS/390:

> In addition to storing documents in repositories/databases in XML format, there is a need to store and retrieve XML data in current enterprise data formats, to enable rapid exploitation of existing data in e-commerce XML applications while continuing to support existing applications against that data. This research project will propose techniques and algorithms to manage the automatic composing of XML documents from existing enterprise data, and conversion back to proprietary formats from XML The project will include effective ways to prepare XML documents from multiple enterprise data sources using XML name spaces, and algorithms to combine/merge DTDs. Initial deliverables will include articulation of the OS/390 XML strategy and its validation via proof of concept. The OS/390 division, with research, will also undertake validation with customers and ISVs.

The sentence I've marked in blue was the impetus for determining how OE references MVS datasets today. I realize this project description is high-level, but the project is just now getting kicked off.

Cheers, Denise
Lotus Notes Address: Denise Y. Dyko/Poughkeepsie/IBM@IBMUS
VM Address: KGNVMC.DYKO@VM
Internet Address: DYD@VNET.IBM.COM
Phone: (914)435-6903, t/l 8-295-6903

Exhibit C

Jen-Yao Chung/Watson/IBM
05/27/2004 04:14 PM
This document expires on
05/27/2103

To ShyhKwei Chen/Watson/IBM@IBMUS
cc
bcc
Subject Re: *IBM Confidential: XML Activities and Contacts for AS/400, RS/6000, S/390

Best regards,
Jen-Yao Chung
CTO, Global Electronics Industry (GEI)
914/945-3422 (T/L 862) jychung@us.ibm.com
http://www.research.ibm.com/people/j/jychung
Denise Y. Dyko 11/30/98 05:44 PM

Denise Y. Dyko 11/30/98 05:44 PM

To: Gerry Meyer/Rochester/IBM@IBMUS
cc: David Boutcher/Rochester/IBM@IBMUS, De Vonna Naivar/Austin/IBM@IBMUS, Theresa Backlund/Rochester/IBM@IBMUS, Mike Tomashek/Rochester/IBM@IBMUS, Gerry Hackett/Austin/IBM@IBMUS, Thomas Rozmus/Poughkeepsie/IBM@IBMUS, Doug Balog/Poughkeepsie/IBM@IBMUS, Jim Porell/Poughkeepsie/IBM@IBMUS, Jen-Yao Chung/Watson/IBM@ibmus
From: Denise Y. Dyko/Poughkeepsie/IBM @ IBMUS
Subject: Re: *IBM Confidential: XML Activities and Contacts for AS/400, RS/6000, S/390

Hi, Gerry, we still haven't managed to connect by phone. Our XML efforts are at "workbook" level, not yet strategy document. I've attached the first draft of the OS/390 XML workbook. Our key focus is on infrastructure and we have funded 2PY in Reserach for the following project definition (which is also included in the Workbook):

RESEARCH PROJECT DEFINITION:
In addition to storing documents in repositories/databases in XML format, there is a need to store and retrieve XML data in current enterprise data formats, to enable rapid exploitation of existing data in e-commerce XML applications while continuing to support existing applications against that data. This research project will propose techniques and algorithms to manage the automatic composing of XML documents from existing enterprise data, and conversion back to proprietary formats from XML. The project will include effective ways to prepare XML documents from multiple enterprise data sources using XML name spaces, and algorithms to combine/merge DTDs. Initial deliverables will include articulation of the OS/390 XML strategy and its validation via proof of concept. The OS/390 division, with research, will also undertake validation with customers and ISVs.

Other work will include support of XML by individual products/components (e.g., DB2 as an XML repository) and exploitation of XML by individual products/components in their own implementation (e.g., to replace existing proprietary data formats). But we have no overall OS/390 product plan yet --and certainly not one that is funded. We did begin testing of the XML parser on OS/390 and ran into EBCDIC/ASCII problems; I will be interested to hear about your experiences with the XML parser on AS/400.

Hope to talk to you soon.

Cheers, Denise
Lotus Notes Address: Denise Y. Dyko/Poughkeepsie/IBM@IBMUS
VM Address: KGNVMC.DYKO@VM
Internet Address: DYD@VNET.IBM COM
Phone: (914)435-6903, t/l 8-295-6903

Gerry Meyer 11/23/98 10:53

To: Denise Y. Dyko/Poughkeepsie/IBM@IBMUS, De Vonna Naivar/Austin/IBM@IBMUS
cc: David Boutcher/Rochester/IBM@IBMUS, Jim Herring/Rochester/IBM@IBMUS, Theresa Backlund/Rochester/IBM@IBMUS, Mike Tomashek/Rochester/IBM@IBMUS, Gerry Hackett/Austin/IBM@IBMUS, Thomas Rozmus/Poughkeepsie/IBM@IBMUS, Doug Balog/Poughkeepsie/IBM@IBMUS
From: Gerry Meyer/Rochester/IBM@IBMUS
Subject: *IBM Confidential: XML Activities and Contacts for AS/400, RS/6000, S/390

Please complete the attached Freelance chart for your system showing your XML contacts and activities
Please add any additional categories, activities, etc. Give me or Dave Boutcher a call for any questions

Gerry Meyer
Senior Technical Staff Member
AS/400 System Software Development
Internet ID: gerrym@us.ibm.com
Ext 3-7266

XML Activities and Contacts PRZ has been deleted (was saved in repository My Attachments Repository ->) from this note on 14 August 2000 by Jen-Yao Chung

390xmlwkbk.lwp has been deleted (was already in repository My Attachments Repository ->) from this note on 14 August 2000 by Jen-Yao Chung

Exhibit D

Jen-Yao Chung/Watson/IBM
05/27/2004 04:13 PM
This document expires on
05/27/2103

To ShyhKwei Chen/Watson/IBM@IBMUS
cc
bcc
Subject Re: XML 390 foils

Denise Y. Dyko 12/03/98 06:10 PM

Denise Y. Dyko 12/03/98 06:10 PM

To: Ming-Ling Lo/Watson/IBM@IBMUS
cc: Jen-Yao Chung/Watson/IBM@Ibmus, ShyhKwei Chen/Watson/IBM@IBMUS, George Zagelow/Santa Teresa/IBM@ibmus
From: Denise Y. Dyko/Poughkeepsie/IBM @ IBMUS
Subject: Re: XML 390 foils

Thank, Ming-Ling. This looks wonderful; I look forward to tomorrow's call. Would one of you be willing to present at the XML summit? (George, I think we have a presenter.)

Cheers, Denise
Lotus Notes Address: Denise Y. Dyko/Poughkeepsie/IBM@IBMUS
VM Address: KGNVMC.DYKO@VM
Internet Address: DYD@VNET.IBM.COM
Phone: (914)435-6903, t/l 8-295-6903

Ming-Ling Lo
12/03/98 05:56 PM

To: Denise Y. Dyko/Poughkeepsie/IBM@IBMUS
cc: Jen-Yao Chung/Watson/IBM@IBMUS, ShyhKwei Chen/Watson/IBM@IBMUS
From: Ming-Ling Lo/Watson/IBM @ IBMUS
Subject: XML 390 foils

Hi, Denise:
I am also involved in the XML 390 project.
In the attachment please find the set of foils for tomorrow's phone conference.
Please let me know if there is any problm.
Thanks.
-Mingling

Ming-Ling Lo
Research Staff Member, IBM T.J.Watson Research Center
Phone: (914) 784-7734, t/l: 863 7734
Email: mingling@watson.ibm.com, mllo@us.ibm.com

Email: mingling@watson.ibm.com, mllo@us.ibm.com

Xml390.prz has been deleted (was already in repository My Attachments Repository -> ) from this note on 14 August 2000 by Jen-Yao Chung

Jen-Yao Chung/Watson/IBM
05/27/2004 04:13 PM
This document expires on
05/27/2103

To ShyhKwei Chen/Watson/IBM@IBMUS
cc
bcc
Subject Re: XML 390 Access Server presentation at the XML summit

Denise Y. Dyko 12/04/98 09:48 AM

Denise Y. Dyko 12/04/98 09:48 AM

To: George Zagelow/Santa Teresa/IBM@ibmus
cc: Jen-Yao Chung/Watson/IBM@ibmus, ShyhKwei Chen/Watson/IBM@IBMUS, Ming-Ling Lo/Watson/IBM@IBMUS
From: Denise Y. Dyko/Poughkeepsie/IBM @ IBMUS
Subject: XML 390 Access Server presentation at the XML summit

Hi, George, Ming-Ling Lo or Shyh-Kwei Chen can present at the XML Summit on "XML Access Server for IBM 390." A draft of the presentation is in the attached note (which I also sent you yesterday). I'd suggest 45 minutes for the presentation. The XML Access Server is the XML research project being funded by OS/390.

Cheers, Denise
Lotus Notes Address: Denise Y. Dyko/Poughkeepsie/IBM@IBMUS
VM Address: KGNVMC.DYKO@VM
Internet Address: DYD@VNET.IBM.COM
Phone: (914)435-6903, t/l 8-295-6903

---------- Forwarded by Denise Y. Dyko/Poughkeepsie/IBM on 12/04/98 09:44 AM ----------

Ming-Ling Lo
12/03/98 05:56 PM

To: Denise Y. Dyko/Poughkeepsie/IBM@IBMUS
cc: Jen-Yao Chung/Watson/IBM@IBMUS, ShyhKwei Chen/Watson/IBM@IBMUS
From: Ming-Ling Lo/Watson/IBM @ IBMUS
Subject: XML 390 foils

Hi, Denise:
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In the attachment please find the set of foils for tomorrow's phone conference.
Please let me know if there is any problm.
Thanks.
-Mingling

Ming-Ling Lo
Research Staff Member, IBM T.J.Watson Research Center

Phone: (914) 784-7734, t/l: 863 7734
Email: mingling@watson.ibm.com, mllo@us.ibm.com

Xml390.prz has been deleted (was already in repository My Attachments Repository ->) from this note on 14 August 2000 by Jen-Yao Chung

Jen-Yao Chung/Watson/IBM
05/27/2004 04:13 PM
This document expires on
05/27/2103

To ShyhKwei Chen/Watson/IBM@IBMUS
cc
bcc
Subject Re: XML 390 foils

Denise Y. Dyko 12/04/98 12:55 PM

Denise Y. Dyko 12/04/98 12:55 PM

To: Gerry Meyer/Rochester/IBM@IBMUS
cc: Jen-Yao Chung/Watson/IBM@ibmus, Ming-Ling Lo/Watson/IBM@IBMUS, ShyhKwei Chen/Watson/IBM@IBMUS
From: Denise Y. Dyko/Poughkeepsie/IBM @ IBMUS
Subject: XML 390 foils

Hi, Gerry, attached is a presentation that further defines the Research project for an XML Access Server for 390.
Ming-Ling or ShyhKwei will be presenting the XML Access Server at the XML Summit. You can contact Jen-Yao Chung (project manager) or either of them for more information.

Cheers, Denise
Lotus Notes Address: Denise Y. Dyko/Poughkeepsie/IBM@IBMUS
VM Address: KGNVMC.DYKO@VM
Internet Address: DYD@VNET.IBM.COM
Phone: (914)435-6903, t/l 8-295-6903

---------- Forwarded by Denise Y. Dyko/Poughkeepsie/IBM on 12/04/98 12:09 PM ----------

Ming-Ling Lo
12/03/98 05:56 PM

To: Denise Y. Dyko/Poughkeepsie/IBM@IBMUS
cc: Jen-Yao Chung/Watson/IBM@IBMUS, ShyhKwei Chen/Watson/IBM@IBMUS
From: Ming-Ling Lo/Watson/IBM @ IBMUS
Subject: XML 390 foils

Hi, Denise:
I am also involved in the XML 390 project.
In the attachment please find the set of foils for tomorrow's phone conference.
Please let me know if there is any problm.
Thanks.
-Mingling

Ming-Ling Lo
Research Staff Member, IBM T.J.Watson Research Center
Phone: (914) 784-7734, t/l: 863 7734

Xml390.prz has been deleted (was already in repository My Attachments Repository ->) from this note on 14 August 2000 by Jen-Yao Chung

Jen-Yao Chung/Watson/IBM
05/27/2004 04:12 PM
This document expires on
05/27/2103

To ShyhKwei Chen/Watson/IBM@IBMUS
cc
bcc
Subject Re: XML 390 Access Server presentation at the XML summit

Denise Y. Dyko 12/09/98 02:29 PM

Denise Y. Dyko 12/09/98 02:29 PM

To: David Fallside/Santa Teresa/IBM@ibmus
cc: Ming-Ling Lo/Watson/IBM@IBMUS, ShyhKwei Chen/Watson/IBM@IBMUS, Jen-Yao Chung/Watson/IBM@ibmus, Robert Geiner/Poughkeepsie/IBM@IBMUS, George Zagelow/Santa Teresa/IBM@ibmus
From: Denise Y. Dyko/Poughkeepsie/IBM @ IBMUS
Subject: Re: XML 390 Access Server presentation at the XML summit

Dave, perhaps the word "server" is confusing. Think of the 390 project as an application. I checked with Rob Geiner and he isn't aware that WebSphere is planning on providing XML support for access to legacy data. Are you aware of any WebSphere work in this area? Our application could *work* in a WebSphere environment –we already have a lunchtime meeting scheduled at the XML summit next week to begin discussing implementation environment.

I'm in San Jose this week for the SDC (and to meet with DB2 folks) and have irregular access to the network. Most immediately, my primary interest is getting this topic introduced at the XML summit. Ming and Shyh-Kwei, could you cut down the pitch to 15 minutes? Can you work with Dave and George directly? I suspect I might be a bottleneck this week.

And I'll try to call you, Dave.

Cheers, Denise
Lotus Notes Address: Denise Y. Dyko/Poughkeepsie/IBM@IBMUS
VM Address: KGNVMC.DYKO@VM
Internet Address: DYD@VNET.IBM.COM
Phone: (914)435-6903, t/l 8-295-6903

David Fallside

12/08/98 09:30 PM

To: Denise Y. Dyko/Poughkeepsie/IBM
cc: George Zagelow/Santa Teresa/IBM@ibmus, Jen-Yao Chung/Watson/IBM@ibmus, Ming-Ling Lo/Watson/IBM@IBMUS, ShyhKwei Chen/Watson/IBM@IBMUS
From: David Fallside/Santa Teresa/IBM@IBMUS
Subject: Re: XML 390 Access Server presentation at the XML summit

Denise, after looking over Mingling's foils and reading your reply, I have to say that XAS/390 appears very similar to Websphere
and I don't see that XAS/390 is any more or less of an architecture or application than Websphere is already. One option might be

to put a short, say 15 minute, XAS/390 presentation after the Websphere presentation in order to invite questions of comparison.
Another option is to discuss the particular requirements of the 390 platform, perhaps using input from both XAS/390 and the
Websphere/390 project.

.....

David C. Fallside, IBM
916.457.2830
fallside@us.ibm.com

Denise Y. Dyko 12/08/98 07:36 AM

To: George Zagelow/Santa Teresa/IBM@ibmus
cc: David Fallside/Santa Teresa/IBM@ibmus, Jen-Yao Chung/Watson/IBM@ibmus, Ming-Ling Lo/Watson/IBM@IBMUS, ShyhKwei Chen/Watson/IBM@IBMUS
From: Denise Y. Dyko/Poughkeepsie/IBM @ IBMUS
Subject: Re: XML 390 Access Server presentation at the XML summit

Hi, George, I don't know the topics of the other proposed presentations but I suspect the390 application server might be unique in terms of its generalized solution for XML access to legacy data. It's an architecture as much as an application. The first draft of the presentation does not include implementation issues and requirements (should the XML Access Server be implemented as a WebSphere application? under a ComponentBroker environment?). The funding we have does not even cover all of the implementation issues, incuding curency issues (concurrent access to the data by existing applications and new XML applications). We can add a foil on those issues and requirements.

I expect many of the audience should know about this project and might have requirements for this project, at least in terms of the ability to integrate what they're doing or perhaps in their ability to depend on the existence of this architecture. If necessary, I imagine we can present in half an hour. But I do think it's important that the XML community be aware of this project.

Cheers, Denise
Lotus Notes Address: Denise Y. Dyko/Poughkeepsie/IBM@IBMUS
VM Address: KGNVMC.DYKO@VM
Internet Address: DYD@VNET.IBM.COM
Phone: (914)435-6903, t/l 8-295-6903

George Zagelow
12/04/98 06:34 PM

To: Denise Y. Dyko/Poughkeepsie/IBM@IBMUS
cc: David Fallside/Santa Teresa/IBM@ibmus
From: George Zagelow/Santa Teresa/IBM@IBMUS
Subject: Re: XML 390 Access Server presentation at the XML summit

Denise, thanks for the proposed talk. We're in evaluation mode as we've got more talks than will fit in the agenda. Is there anything unique in the application? And do you have requirements or issues to bring forward to Robert? I don't see any in the pitch.... Thanks much...

Regards, George
Programming Consultant
1-408-463-4041 or 543-4041, FAX 4763
Lotus Notes: George Zagelow/Santa Teresa/IBM@IBMUS

VM: IBMUSM50(ZAGELOW)
Internet: zagelow@us.ibm.com

Denise Y. Dyko 12/04/98 06:48 AM

To: George Zagelow/Santa Teresa/IBM@ibmus
cc: Jen-Yao Chung/Watson/IBM@ibmus, ShyhKwei Chen/Watson/IBM@IBMUS, Ming-Ling Lo/Watson/IBM@IBMUS
From: Denise Y. Dyko/Poughkeepsie/IBM @ IBMUS
Subject: XML 390 Access Server presentation at the XML summit

Hi, George, Ming-Ling Lo or Shyh-Kwei Chen can present at the XML Summit on "XML Access Server for IBM 390." A draft of the presentation is in the attached note (which I also sent you yesterday). I'd suggest 45 minutes for the presentation. The XML Access Server is the XML research project being funded by OS/390.

Cheers, Denise
Lotus Notes Address: Denise Y. Dyko/Poughkeepsie/IBM@IBMUS
VM Address: KGNVMC.DYKO@VM
Internet Address: DYD@VNET.IBM.COM
Phone: (914)435-6903, t/l 8-295-6903

---------- Forwarded by Denise Y. Dyko/Poughkeepsie/IBM on 12/04/98 09:44 AM ----------

Ming-Ling Lo
12/03/98 05:56 PM

To: Denise Y. Dyko/Poughkeepsie/IBM@IBMUS
cc: Jen-Yao Chung/Watson/IBM@IBMUS, ShyhKwei Chen/Watson/IBM@IBMUS
From: Ming-Ling Lo/Watson/IBM @ IBMUS
Subject: XML 390 foils

Hi, Denise:
I am also involved in the XML 390 project.
In the attachment please find the set of foils for tomorrow's phone conference.
Please let me know if there is any problm.
Thanks.
-Mingling

Ming-Ling Lo
Research Staff Member, IBM T.J.Watson Research Center
Phone: (914) 784-7734, t/l: 863 7734
Email: mingling@watson.ibm.com, mllo@us.ibm.com

Xml390.prz has been deleted (was already in repository My Attachments Repository ->) from this note on 14 August 2000 by Jen-Yao Chung

Jen-Yao Chung/Watson/IBM
05/27/2004 04:12 PM
This document expires on
05/27/2103

To ShyhKwei Chen/Watson/IBM@IBMUS
cc
bcc
Subject Re: XML Summit Agenda

Jen-Yao Chung
12/10/98 07:06 PM

To: Denise Y. Dyko/Poughkeepsie/IBM@IBMUS
cc: Ming-Ling Lo/Watson/IBM@IBMUS, ShyhKwei Chen/Watson/IBM@IBMUS, Anant Jhingran/Watson/IBM@IBMUS
From: Jen-Yao Chung/Watson/IBM @ IBMUS
Subject: Re: XML Summit Agenda

Hi Denise, thank to your recommendation. We are glad to see that our xml/390 presentation was accepted.

Ming-Ling, ShyhKwei, please revise the presentation following the instruction for the speaker information. Please run your presentation through Anant first. Thanks. -chung

George Zagelow
12/10/98 02:14 PM

To: Marie Wieck/Somers/IBM@ibmus, Simon Phipps/UK/IBM@IBMGB, Jason Woodard/Armonk/IBM@ibmus, Thomas Rowe/Raleigh/IBM@IBMUS, Ming-Ling Lo/Watson/IBM@IBMUS, Douglas Wright/Somers/IBM@ibmus, Andre Tost/Rochester/IBM@IBMUS, Robert Weida/Thornwood/IBM@IBMUS, Jen-Yao Chung/Watson/IBM@IBMUS, Donald Eastlake/Hawthorne/IBM@IBMUS, Noah Mendelsohn@Lotus, Joe Guthridge/ATL/Lotus@LOTUS, Dan Chang/Santa Teresa/IBM@ibmus, John Ibbotson/UK/IBM@IBMGB, Pat O'Connor/Cupertino/IBM@IBMUS, LOTUS.SBCA8178@VM, Brad Topol/Raleigh/IBM@IBMUS, Rakesh Mohan/Watson/IBM@IBMUS, Andrew Donoho/Austin/IBM@IBMUS, Yih-Shin Tan/Raleigh/IBM@IBMUS, Bob Schloss/Watson/IBM@ibmus, David Fallside/Santa Teresa/IBM@ibmus, David A Epstein/Watson/IBM@IBMUS, sanjiva@watson.ibm.com@IBMUS, Scott Sylvester/Endicott/IBM@IBMUS, David Lection/Raleigh/IBM@IBMUS, Doug Tidwell/Raleigh/IBM@IBMUS, Toby Lehman/Almaden/IBM@IBMUS, Craig Hayman/Raleigh/IBM@IBMUS, Chris Piekny/Toronto/IBM@IBMCA, Dave Pullin/Raleigh/IBM@IBMUS, Tom Glover/Toronto/IBM@IBMCA, Giuseppe Facchetti/Santa Teresa/IBM@ibmus, Stephen Brodsky/Santa Teresa/IBM@IBMUS
cc: Robert LeBlanc/Somers/IBM@IBMUS, Angel Luis Diaz/Watson/IBM@IBMUS, David Sharp/Raleigh/Contr/IBM@IBMUS
From: George Zagelow/Santa Teresa/IBM@IBMUS
Subject: XML Summit Agenda

Greetings, speakers for the XML Summit!! Below is the agenda that will be appearing on the web site today. We've tried for some rough groupings of topics, taking into consideration known speaker scheduling conflicts. We'd like to stay as close to this schedule as possible. Please check your names / topics. You'll find the timings to be perhaps shorter than we had discussed. Please try to accomodate, as the schedule is very dense, and we'll have to manage the time closely. If there are issues/changes for speaker names, topic titles, or timing, please let me know asap. In particular, for those talks where multiple presenters are listed, please let me know who the speaker will be. And, finally, the Summit web site has important speaker information, including handling of copies of your presentation. Thanks much, and I look forward to seeing you all next week....

Regards, George
Programming Consultant
1-408-463-4041 or 543-4041, FAX 4763
Lotus Notes: George Zagelow/Santa Teresa/IBM@IBMUS
VM: IBMUSM50(ZAGELOW)
Internet: zagelow@us.ibm.com

---------- Forwarded by George Zagelow/Santa Teresa/IBM on 12/10/98 10:53 AM ----------

Tuesday, December 15th

8:30 Welcome and Introduction - Robert LeBlanc
8:45 Strategy Update - Marie Wieck
9:15 Marketing Update - Simon Phipps
9:45 eBAF - Jason Woodard
10:15 Break
10:45 WebSphere - Tom Rowe
11:30 XML Access Server for the IBM 390 - Ming-Ling Lo
noon Lunch
1:00 XML and Solutions - Doug Wright
1:30 San Francisco - Andre Tost
2:00 RosettaNet, Catalog Architect, and the Information Supply Chain - Robert Weida
2:30 XML/EDI Pilot for IBM Procurement - Jen-Yao Chung
3:00 Break
3:30 Open Trading Protocol (IOTP) - Donald Eastlake
3:50 Lotus - Noah Mendelsohn and Joe Guthridge
4:20 DB2 - Dan Chang
4:50 MQ Series and CICS - John Ibbotson

Wednesday, December 16th

8:30 XML Parser, XPK4J, etc. - Pat O'Connor
9:00 LotusXSL Processor - Scott Boag
9:20 Transcoding and PBC - Brad Topol
9:50 XML/CAF - Rakesh Mohan
10:10 Break
10:40 Trinity - Andrew Donoho
11:00 Host Integration - Yihshin Tan
11:20 IBM Research Topics - Bob Schloss
12:00 Lunch
1:00 Standards Update - Fallside
2:00 BML - David E/ Sanjiva Weerarana (Watson)
2:20 PDML - Scott Sylvester / Doug Boucher (Rochester)
2:40 Lidea - David Lection
3:00 Break
3:30 XML Directory Access and Query - Doug Tidwell
3:50 Modal - Armando Morales (RTP) / Toby Lehman (Almaden)
4:10 Convergence activities - David Epstein or Pat O'Connor
4:20 Visual Age - Craig Hayman
4:50 Component Broker - Chris Piekny

Thursday, December 17th

8:30 XML Java Beans - Dave Pullin
8:50 Net Objects - Tom Glover
9:05 Data Warehousing and XML - Facchetti
9:35 RDF - Bob Schloss for 20 min
9:55 Break
10:35 XMI/RDF/XML Schema positioning - Brodsky
10:55 Summary / Open discussion - Wieck
11:45 Closing - Robert LeBlanc
noon Summit Ends

Exhibit E

XML Access Server for IBM 390

Ming-Ling Lo, Shyh-Kwei Chen, Jen-Yao Chung
Institute of Advanced Commerce
IBM T.J.Watson Research Center

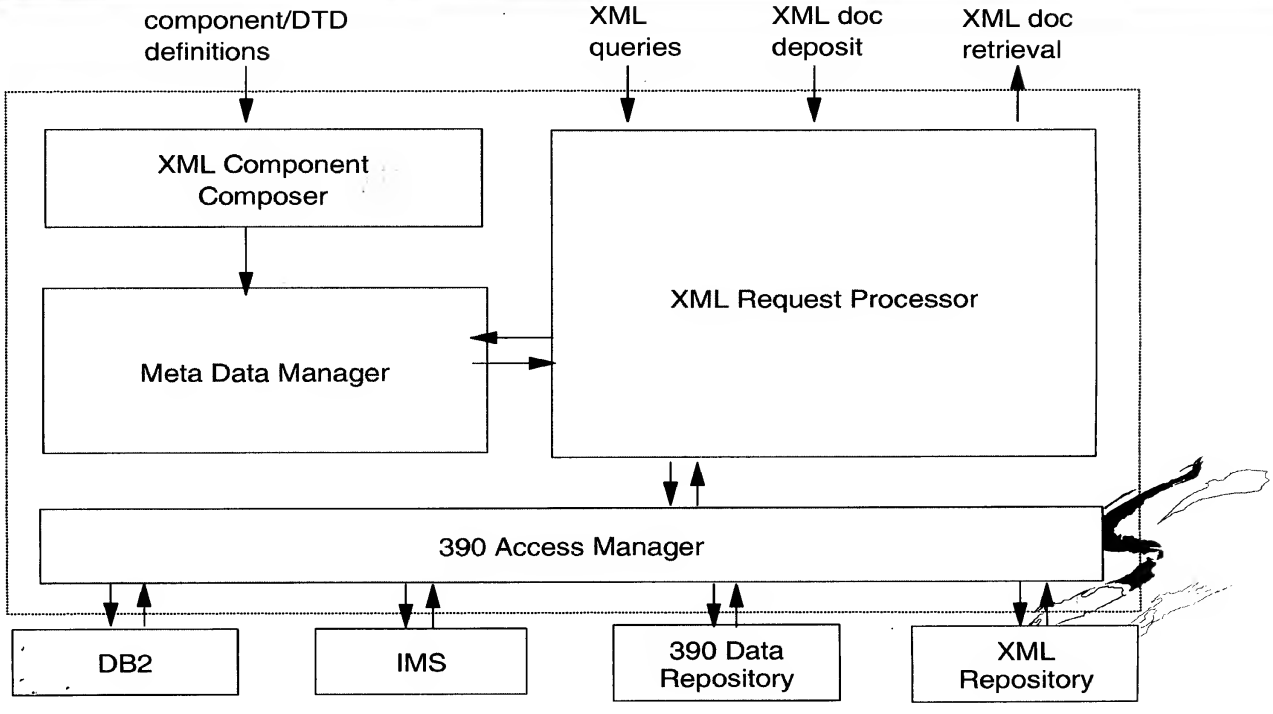
Project Overview

- Enable rapid exploitation of existing enterprise data in XML eCommerce applications
  - Co-existence with existing enterprise data applications
- Store/retrieve XML data in current enterprise data formats
  - Automatic composition of XML docs from and decomposition of XML docs into multiple enterprise data sources
- Partnership with Poukeepsie (Denise Dyko)

XML Access Solutions

- A. Store one XML doc in one piece
  - e.g. as one file, as one LOB in a record
- B. Store one XML doc in one or more pieces
  - e.g. linked by xlinks
- C. Store XML docs in XML format
  - tags really appear in physical storage
- D. Store XML docs in more than XML format
  - tags not necessarily appear in physical storage
- XAS Project - An effort in B&D

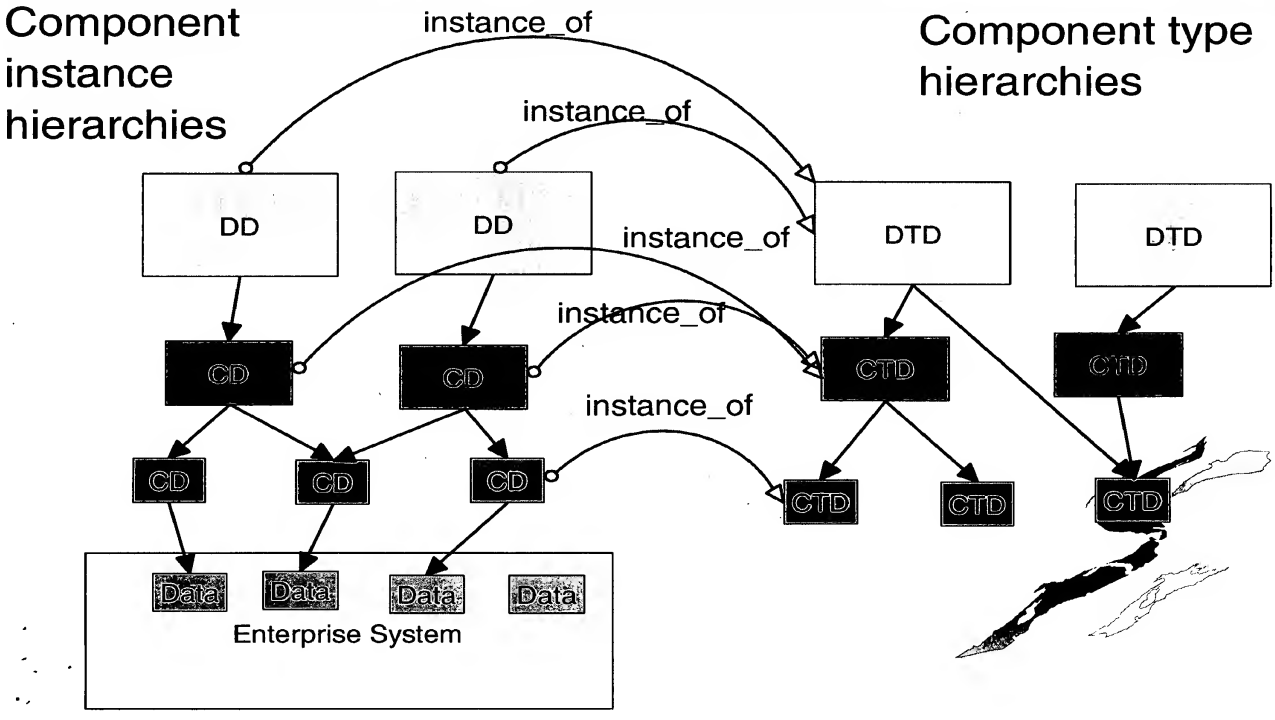
XAS/390 Overall Architecture



XML Meta Data in XAS/390

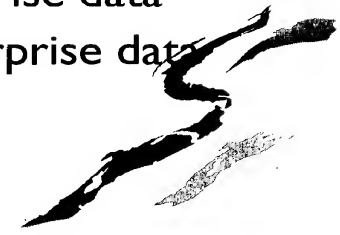
- Document type definitions(DTD)
  - Define legal document structures
- Also use the following internal, logical entities ---
- Component type definitions (CTD)
  - Building blocks of DTD
- Document definitions (DD)
  - Instantiation of DTD
- Component definition (CD)
  - Instantiation of CTD
  - Lowest level maps to data sources
- May use XML namespaces, xlink

Meta Data - Component Library



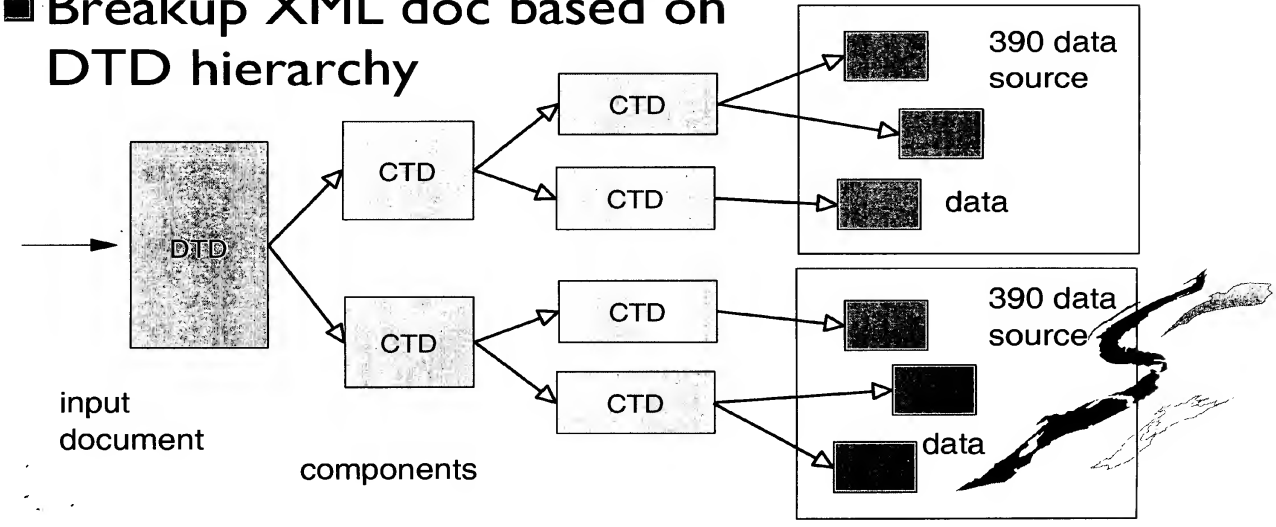
XAS Meta Data Manager

- Consists of
  - XML Meta Data Manager
    - Manage XML component library (DTD, etc..)
    - Manage mapping from CTD/CD to data sources
  - 390 Meta Data Manager
    - Has knowledge about
      - content, locations, formats of enterprise data
      - other information for accessing enterprise data systems (user name, password, etc.)



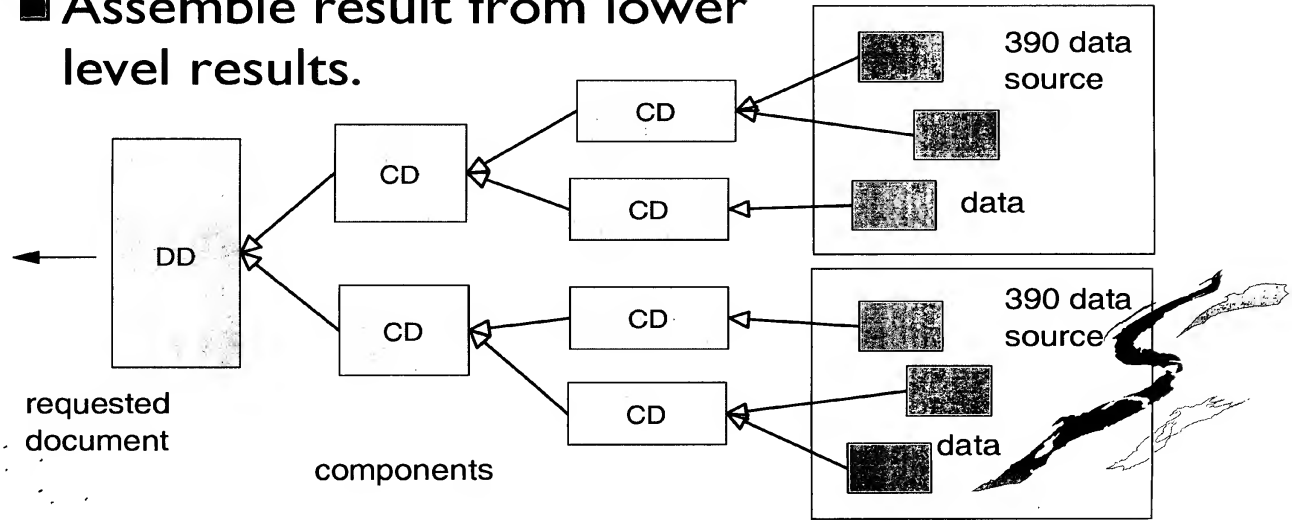
Document Deposit

- Translate into multiple enterprise system source access requests
- Breakup XML doc based on DTD hierarchy



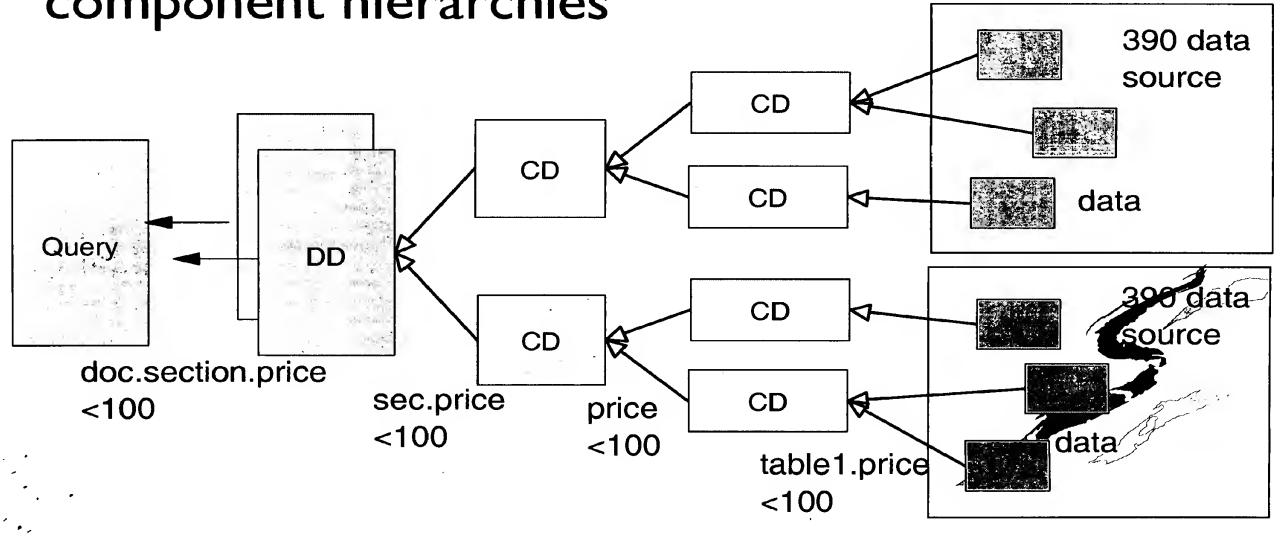
Document Retrieval

- Translated into multiple enterprise system access requests
- Assemble result from lower level results.



XML Query

- Similar to document retrieval
- Push/transform query constraints down component hierarchies

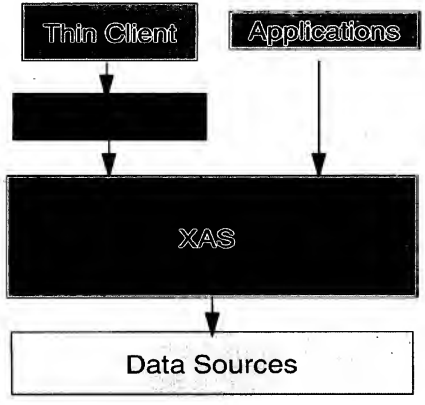


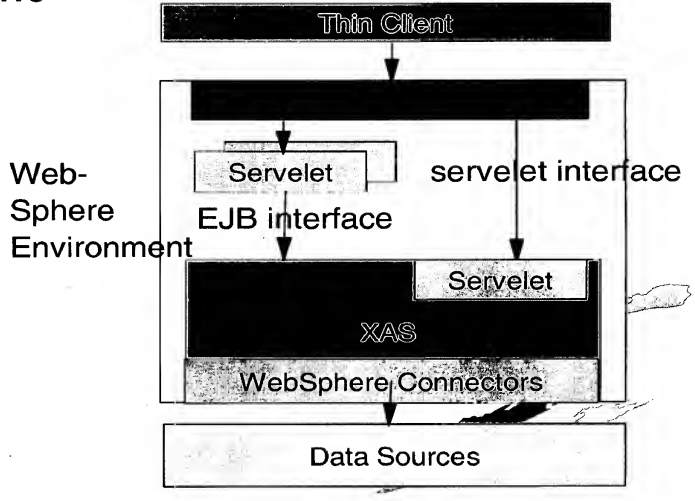
Interesting Research Questions

- Highly dynamic, flexible and cheap doc composition --
  - Create one doc is creating one DD node
- What's important may be doc content but not boundary
  - can we use this to help answer decision support questions?
- Can we dynamically create one big XML doc to answer multiple XML doc query?
- Efficiency Issues
- Data sources not under control

Potential Ways of Application and Deployment

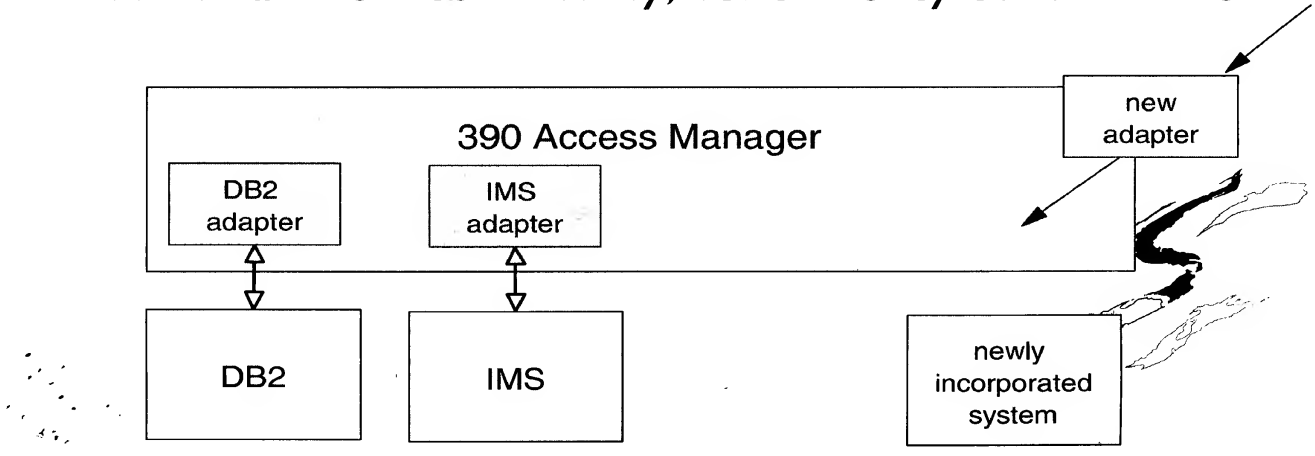
- Standalone
  - Direct access by business applications and browsers.
- In WebSphere environment





390 Access Manager

- Direct access to 390 enterprise systems
- Maintain session, connection, etc..
- Limit data source specific dependency to low level
- Add new enterprise system by adding adapter
- Need to address consistency, concurrency control issues



XML Request Processing

- XML document retrievals
  - Translate into enterprise data source retrievals
- XML document deposits
  - Digested and undigested DTD
    - digested DTD: mapping to data sources is defined
  - Initially support only digested DTD
- XML queries
  - Standard not fixed yet
    - Standard may or may not be adequate
  - Closely monitor standard
  - Make implementation flexible, extensible

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Patent Application Ser. No.: 09/466,627 Group Art Unit: 2176

Filing Date: 12/17/1999 Examiner: M. NGUYEN

Attorney Docket Number YO999-429 Inventor Name(s): LO ET AL.

Title: METHOD AND APPARATUS FOR CONVERTING BETWEEN DATA SETS AND XML DOCUMENTS

Commissioner for Patents
P.O. Box 1450
Alexandria VA 223131-1450

DECLARATION OF SHYH-KWEI CHEN, PH.D.

Sir:

I, Shyh-kwei Chen, Ph.D., hereby declare as follows:

1. I am one of the named inventors in the above-identified application. My co-inventor, Ming-ling Lo, is no longer employed by the assignee of this invention, IBM. Accordingly, he is not readily available and is not joining me on this declaration. Nevertheless, I believe that he would agree with what I declare here.

2. Attached as Exhibt A is a copy of a presentation that I made with my co-inventor Ming-ling Lo and my manager Jen-Yao Chung in December of 1998 discussing the project that Ming-ling Lo and I did relating to XML. This exhibit shows, on page A-3, that we planned to work full time on the project during the entire year of 1999.

3. Attached as Exhibit B is an invention disclosure that I created on April 19, 1999, with my co-inventor Ming-ling Lo, and which matured into the above-identified patent application. I have been informed and believe that this exhibit is a copy of a business

record maintained by the IP Law Department of my employer and assignee, IBM corporation. I therefore trust its accuracy. .

3. Enclosed as Exhibit C is a printout of a computer directory relating to files and/or e-mails relating to this project. These files and/or e-mails have system-generated creation dates that show continuous work on the project that matured into the above-identified patent application from June of 1999 through October of 1999. These documents have titles such as "DTDSA" and "XML," which I recognize as pertaining to this project. These system-generated creation dates are business records that are maintained by the system software of my laptop computer. I do not know how these dates could be altered. I therefore trust their accuracy.

4. Based on looking at Exhibit C, my recollection is refreshed and I also remember that there were earlier files and e-mails dated continuously, throughout the first half of 1999, and relating to this project. These e-mails were destroyed when I got a new laptop on or about June of 1999.

5. Enclosed as exhibit D is a directory printout from my laptop showing the system creation date of exhibit A, namely 12/15/1998.

6. Based on the documents identified above, my recollection is refreshed regarding the events of 1998 and 1999. I therefore remember that Ming-ling Lo and I

   - conceived of the idea of establishing a mapping from lists and scalars corresponding to at least one data source into XML elements and attributes during the summer of 1998;
   - worked at least part time during the fall of 1998 to reduce this invention to practice; and

- worked full time reducing this invention to practice during the entire year of 1999.

7. I further declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Shyh-kwei Chen

Shyh-kwei Chen, Ph.D.

6/9/2004

Date

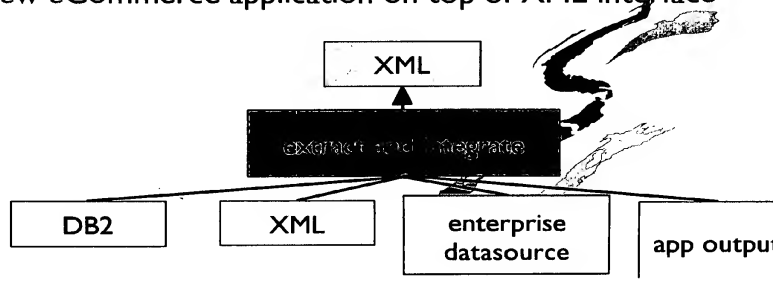
Exhibit A

XML Access Server

IBM T.J.Watson Research Center
Ming-Ling Lo
Shyh-Kwei Chen
Jen-Yao Chung

XAS Project Goals

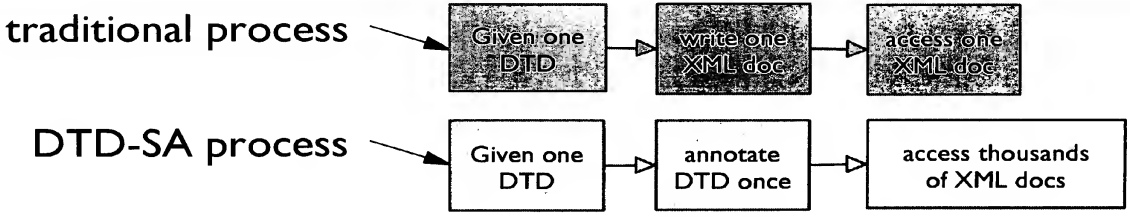
- Machine generated virtual XML documents
- Dynamically extract data from distributed, heterogeneous enterprise data sources, deliver as XML documents
  - Data stored in existing data sources
  - XML as data presentation and transmission format
  - Materialize into XML documents when necessarily
- Motivations: Large amount of data already exists in data systems such as RDB
  - Maximizing investment: re-use data and schema design
  - Avoid re-inventing wheels: business logic already written for RDB, etc; co-exist with existing applications
  - Better data integrity and quality control: one copy of data
  - Connecting to new world: build new eCommerce application on top of XML interface



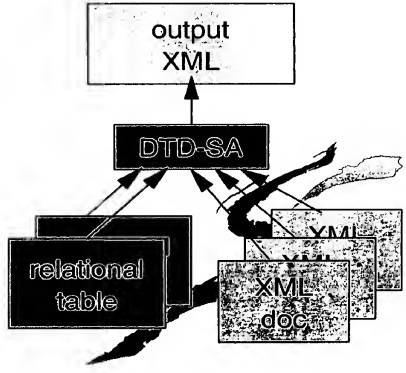
Project Content

- Underlying technology:
  - Approach: Once per type authoring - one authoring effort per DTD, enable access to hundreds/thousands of XML documents of this DTD
  - Rigorous framework for DTD to existing schema mapping
  - Algorithms for type-by-type authoring
    - Enterprise data publishing: given existing data, publish as XML
    - Schema layout given DTD: find best table layout for DTD
    - Cross schema matching: Given DTD and RDB schema for similar purpose, establish mapping
    - Componentized XML construction: Use existing data as building blocks of new XML docs
- Server architecture design and prototyping
  - XML document retrieval, deposit, and query
- Timeframe: 1-12/1999

Mapping Technology: DTD-SA



- DTD-SA = Document Type Definition with Source Annotation
- Framework for specify mapping between DTD and existing schema
  - Existing schema
    - relational-like or DTD-like
- Essentially looks like DTD, but with annotations:
  - value specifications
  - binding specifications
  - Simply DTD when stripped of annotations



Example - Purchase Order

- Purchase order related information described by 4 tables and 1 DTD

PO

POID	BUYER	SELLER
100	20	10

company

COID	NAME	ADDR
10	IBM	NY
20	CITIBANK	NY

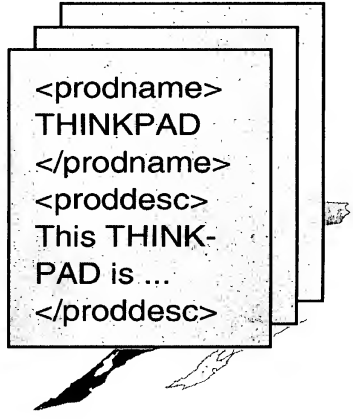
lineitem

POID	PRODID	AMOUNT
100	35678	20k
100	35694	100k

product

PRODID	NAME	DESC.
35678	THINKPAD	
35694	SERVER	

DTD name=pd
(product description)



Example (cont-1)

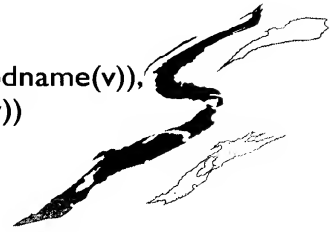
- A purchase order DTD

```
<!ELEMENT PO (id, buyer, seller,  (lineitem)* )>
<!ELEMENT id (#PCDATA)>
<!ELEMENT buyer (name, address)>
<!ELEMENT seller (name, address)>
<!ELEMENT name (#PCDATA)>
<!ELEMENT address (#PCDATA)>
<!ELEMENT lineitem (prodname,   proddesc, amount)>
<!ELEMENT prodname (#PCDATA )>
<!ELEMENT proddesc (#PCDATA )>
<!ELEMENT amount (#PCDATA )>
```

Example (cont-2)

- Add annotation
  - blue: value specification
  - red: binding specification

```
<!ELEMENT PO (id, buyer, seller,  (lineitem)* :: w:= row(lineitem, poid, PO.poid(r))   )>
                :: r:=row(PO, poid, x)
<!ELEMENT id (#PCDATA :PO.<POID>(r) )>
<!ELEMENT buyer (name, address)> :: s:= row(company, id, PO.buyer(r))
<!ELEMENT seller (name, address)> :: s:= row(company, id, PO.seller(r))
<!ELEMENT name (#PCDATA :company.name(s) )>
<!ELEMENT address (#PCDATA :company.addr(s) )>
<!ELEMENT lineitem (
                prodname,
                proddesc :: d:=doc( pd, root.description, product.prodname(v)),
                amount)> :: v:= row( prod, prodid, lineitem.prodid(w))
<!ELEMENT prodname (#PCDATA :product.prodname(v) )>
<!ELEMENT proddesc (#PCDATA :pd.description(d) )>
<!ELEMENT amount (#PCDATA :lineitem.amount(w) )>
```

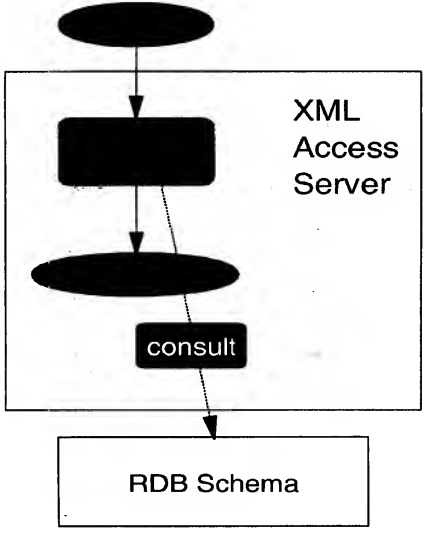


Example (cont-3)

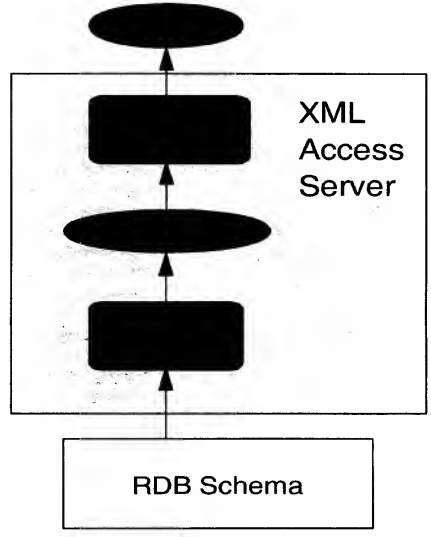
- Retrieve PO document with PO-ID=100 (x=100)

```
<PO>
    <id> 100 </id>
    <buyer>
        <name> CITIBANK </name> <address> NY </address>
    </buyer>
    <seller>
        <name> IBM </name> <address> NY </address>
    </seller>
    <lineitem>
        <prodname> THINKPAD </prodname>
        <proddesc> This THINKPAD is quite good </proddesc>
        <amount> 20K </amount>
    </lineitem>
    <lineitem>
        <prodname> SERVER </prodname>
        <proddesc> This server is the best </proddesc>
        <amount> 100K </amount>
    </lineitem>
</PO>
```

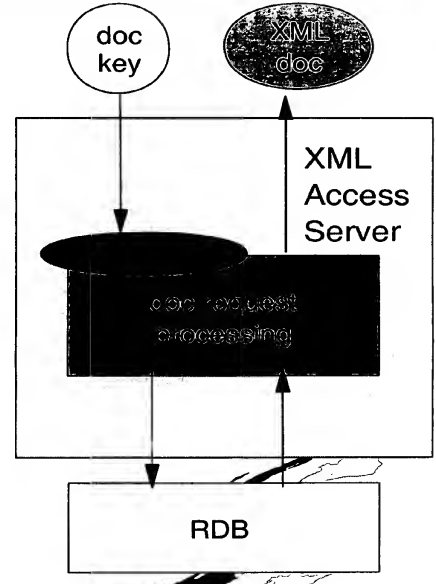
DTD-SA Deployment



1. Annotate given DTD to generate DTD-SA



2. Or construct DTD-SA based on existing RDB schema



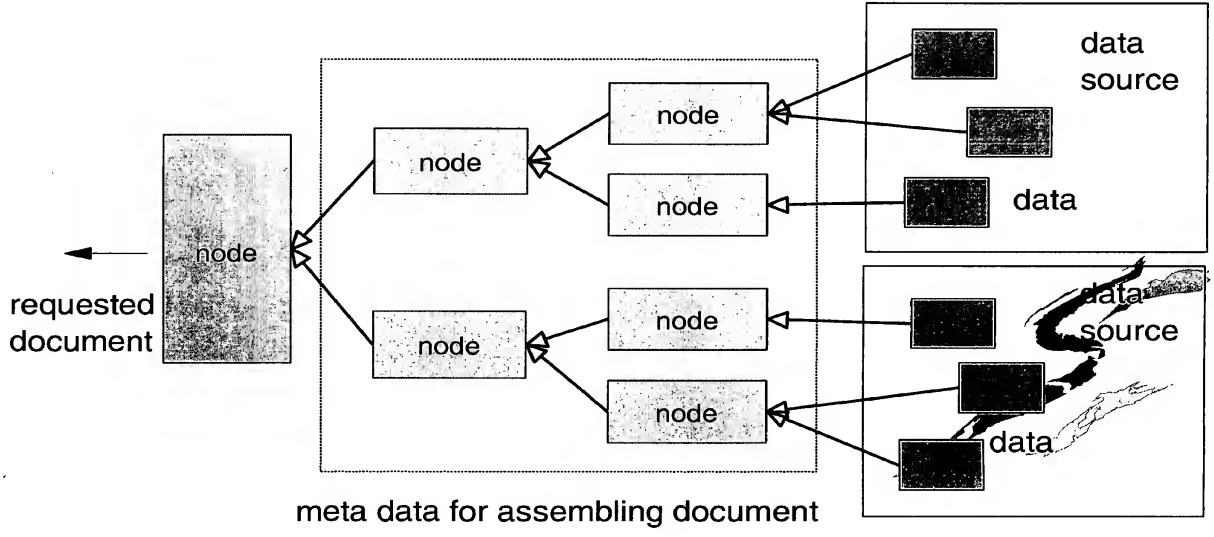
3. Use DTD-SA to guide XML doc access

Advantages

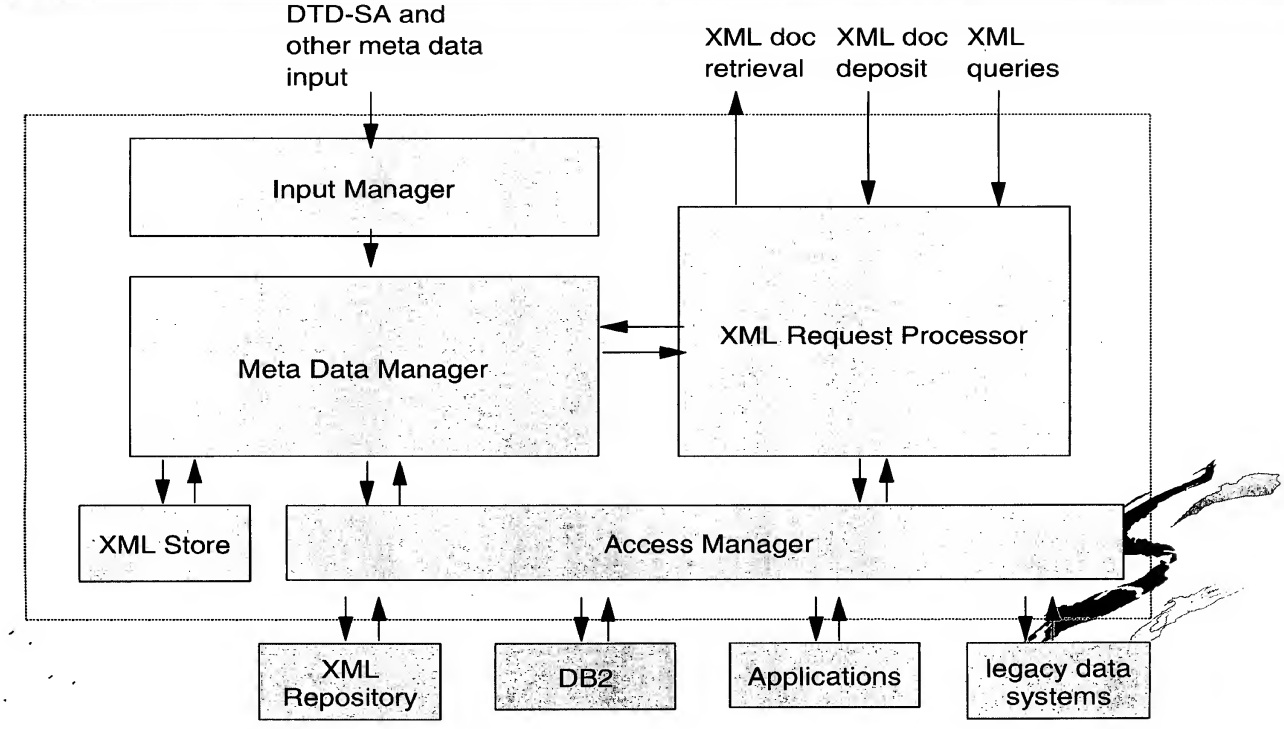
- One target DTD can be composed from multiple
  source tables, schemas, systems (source docs, DTD,repositories)
- Seamless integration of raw data and XML data
  - An output XML document can be woven from mixture of
    - relational columns with raw format data
    - relational columns with XML format data
    - contents of other XML documents
- No changes to source system, schema, and data
- One source schema can map to infinite number of DTDs
- Root element target DTD can start from
  any source table in a network of the foreign key relationships
  (any documents in a collection of source XML documents)
- Mathematically rigorous: foundation for automatic algorithms

Document Access Implementation

- Doc access translated into multiple enterprise DS accesses
- Assemble result from lower level results.
- Manage meta data for assembling XML doc



XAS Overall Architecture



Project Progress

- Accomplished
  - Developed a new technology for mappings between relational schema and XML DTD, called DTDSA
  - Designed architecture framework
  - Ability to extract data from DB2 to XML using DTDSA
- Currently under work
  - Testing XML extraction using DTDSA on 390 environment
  - Storing XML to single source using DTDSA
  - Investigation 390 specific data source, such as VSAM
- Next steps
  - XML as data sources
  - Multiple data sources
  - Developing an algorithm for constructing DTD-SA
  - Scalable meta data management: DCL Graphs
  - Query XML using DTDSA as underlying mechanism

Exhibit B

Disclosure YOR8-1999-0350

Created By: Ming-Ling Lo **Created On:** 04/19/99 05:03:44 PM
Last Modified By: Ming-Ling Lo **Last Modified On:** 04/21/99 12:01:33 PM

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Required fields are marked with the asterisk (*) and must be filled in to complete the form.

Summary

Status	Submitted
Processing Location	YOR
Functional Area	900 Systems & Software-Goyal
Attorney/Patent Professional	Kevin M Jordan/Watson/IBM
Submitted Date	04/21/99 12:00:03 PM
Owning Division	RES
PVT Score	

Inventors with Lotus Notes ID's

Inventors: Ming-Ling Lo/Watson/IBM, ShyhKwei Chen/Watson/IBM

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Inventors without Lotus Notes ID's

IDT Selection

IDT Team:	Attorney/Patent Professional:
	Kevin M Jordan/Watson/IBM

Main Idea

***Title of disclosure (in English)**

A framework for mappings between XML DTD and relational databases

***Idea of disclosure**

1. Describe your invention, stating the problem solved (if appropriate), and indicating the advantages of using the invention.

Problem Description:

XML is emerging as one of the most important format for document and data representation and transmission. Many users and new applications require their input and output to be in XML format. For XML documents, there is the concept of a Document Type Definition (DTD). Each DTD describe the structure of a (potentially infinitely large) set of XML documents. An XML document either has no associated DTD or belongs to exactly one DTD. When an XML document belongs to a DTD, its structure must conform to the specification of the DTD.

There is a large quantity of data already exist in relational databases. These databases are

designed without the expectation that they may one day be accessed for presenting the access result as XML documents. These databases may also have existing applications running on them, still depending on accessing the data in their original format. Furthermore, the data stored in such databases may lack XML specific information such as element tag names or attribute names. Given these facts, it is nonetheless very derivable to access those data in XML format.

High level description of invention:
This invention discloses a framework for creating mappings between XML DTDs and relational database schemas. The relational database can be regarded as having many virtual XML documents of many DTDs stored in them. Each mapping created by our framework specified a subset of these XML documents (which belong to one DTD) explicitly.
Given a DTD to the relational database mapping, when a request for a document of this DTD arrives, the request is automatically translated into accesses to various data items in the database. The accessed data items are then assemble to form the requested XML document. The mapping directs which data items to access, and into which element the accessed data item should go.

Advantages:
The advantages of this approach are:
1. Given such a mapping, those who want to access XML document from relational databases no longer need to be concerned with the details of relational databases. All access and query can be expressed in XML terms.
2. Data in relational database need not be explicitly converted into XML format, saving time and space required for such conversion. Also, because only one copy of data is kept, there is no consistency problem between multiple copies of the same data to worry about.
3. It is not necessary to change the relational database system, the relational schema, or the data itself for the need of exporting relational data in XML format. Existing relational database applications can continue to run without modification.
4. The framework supports flexible mappings. In particular, each relational table is not limited to just one "natural" of default mapping. Each table may as many DTDs defined 1. on them as necessary. Also, a DTD is not limited to map to only one relational table. Instead, each DTD can map to multiple relational tables. The foreign key relationship is incorporated into the framework, and expressed seamlessly in the framework.
5. The framework is mathematically rigorous, and can thus be more efficiently and reliably be implemented.
6. The application of this framework is not limited to relational databases. Any data source that can be modeled in a relational manner (such as those expressible by ODBC or JDBC standards) can be used as a data source in our framework.

2. How does the invention solve the problem or achieve an advantage,(a description of "the invention", including figures inline as appropriate)?

Framework for Mappings

This invention defines a set of syntax and binding rules for mappings between XML DTD and relational databases, call DTD-SA (Document Type Definition data Source Annotation)

Notation:

Symbol	Denoting
T	a relational table
C	a column C; assuming each column identifier is unique with the schema
T.C	same as C, but emphasizing the fact that C is a column of table T
Cx, Cy, Cz	Column variables, whose values are column identities
K	a column value
Kx, Ky, Kz	column value variables
<C>	array of columns <C1, C2, ..., Cn>
<K>	an array of column values <K1, K2, ...Kn>. Note: K1, K2, ...Kn may be in different domains.
<<K>>	a sequence of <K>
row(<C>, <K>)	a function defined only when C1, C2, ... Cn belongs to the same table, and Ki is in the domain of Ci, for all i=1,2...,n. The output of this function is a sequence of rows in table T, with C1=K1, C2=K2, ...Cn=Kn.
T.<C>()	a function which takes a sequence of rows and returns the projection of the sequence in columns <C>
T.C()	shorthand of T.<C>() when there is only one column in <C>

The composite function T.<C1>(row(<C2>, <K>)) can be abbreviated as T.<C1>(<C2>=<K>), or as T.<C1>(<K>) when the identity of <C2> is obvious (e.g. primary key).

Basic Terminology

Specification time: the time when a DTD-SA is specified.
Runtime: the time when a document is either retrieved or queried against.

Basic syntax of DTD-SA

In the following discussion, the function family F<Cout>(r, n), which is a cleaner form for f(T.<Cout>(r), n), where <Cout> is a vector of column identify constants, r is a row variable, and n is an integer, appears many times. The syntax has the following meanings:

1. r is unbounded at specification time and bounded only at runtime.
2. All columns in <Cout> must belong to the same table, T (as is evident from the

B-3

syntax T.<Cout>).

The sub-construct r := row(<C>, <K>) also appears many times. The output of row(<C>, <K>) is a sequence of rows. And the semantics of the construct is:

3. The rows in the sequence are bound to row variable R in turn.

DTD-SA specification rules

The following table lists the original DTD constructs and their annotated counterparts in DTD-SA. For each DTD construct listed a row whose requirement is "must", the construct must be written as the DTD-SA construct as described in the 2nd column. For each DTD construct list in a row whose requirement is "may", it may be replaced with DTD-SA construct listed in the 2nd column, but is not required to. All other DTD construct remains the same in DTD-SA format.

DTD construct	DTD-SA construct	requirement
#PCDATA	#PCDATA :F<Cout>(r, n)	must
#CDATA	#CDATA :F<Cout>(r, n)	must
X, for X=NMTOKEN, NMTOKENS, ID, IDREF, ENTITY, ENTITIES, NOTATION, Enumerated NOTATION.	X:F<Cout>(r, n)	must
...*	...* ::n := F<Cout>(r, m)	must
...*	...* ::r := row(<C>, <K>)	must
...?	...? :: n:=F<Cout>(r, m)	must
(x1x2...xn)	(x1x2...xn) :: n:=F<Cout>(r, m)	must
<!ELEMENT E (....)>	<!ELEMENT E (...)> ::r := row(<C>,<K>)	may

Some terminology can be defined based on the above DTD-SA constructs.
Each DTD-SA construct listed above has either a *content specification* or a *binding specification* associated with it. The content specification is marked by a leading ":", while the binding specification is marked by a leading "::". An content or binding specification is sometimes called a *spec* for convenience. In a DTD-SA, an element definition that contains or is appended with content or binding specifications is called an *annotated element definition (AED)*. Similarly an attribute definition with content or

binding specifications is called an *annotated attribute definition (AAD).* An AED or AAD is sometime called simply an *annotated definition (AD)* for convenience.

Basic Semantics of DTD-SA Construct

A DTD-SA specification consists of a list of DTD specifications, which when stripped of the content and binding specifications, is simply a DTD.

At the high level, DTD-SA works in the following way: during document retrieval time, a set of row variable bindings is supplied to the DTD-SA, causing all unbounded variables in the DTD-SA to become bounded. In the process, the value, or content, for each element and attribute will be generated. The content of the whole XML document will be generated as a result.

The content specification may have unbounded variables. A content specification denotes that, during document retrieval, the content of its associated element is the output of the function described in the content specification, with all variables, if any, bound to some runtime supplied or derived values.

The binding specification specifies that some unbound row variable in its descendent elements and attributes are bound to the value or expressions listed in the specification. The binding specification generally has the form r := row(<C>, <K>), which means the row variable r in the descendent elements will be bound to the output of row(<C>, <K>). The output of row(<C>, <K>) is a sequence of rows. If the DTD construct being annotated is a regular element definition, the first output row is bound to the element. If the DTD construct being annotated is a "*" construct, r inside the "*" construct and in all its descendent elements will be bound to the output of row(<C>, <K>) in turn. The values generated using all these bindings will be the content of the "*" construct.

The specific semantics of the above constructs are further explained below:

a. The integer parameter n:

e.g. #PCDATA :f(T.<C>(r), n)

The use of parameter 'n' is usually for expressing the number of times the annotated #PCDATA appears in its enclosing construct. The parameter n in f(T.C(), n) is especially useful when #PCDATA appear inside the * construct.

Note:

i. In most cases f() is actually an identity function.

ii. In the cases f() does not really depend on n, we will shorthand the function as f(T.<C>(r)). Likewise we can shorthand the function as f(n) or f() when appropriate.

b. ...* :f(T.C(r), n):

in this construct, the output domain of f() is non-negative integers. The output integer m determines the number of repetition for the "*" construct. The numbers 1, 2, ...m will be bound the unbound variable n insides the "*" construct in turn. The result of these bindings will be the content of the "*" construct.

c. ...* ==> ...* ::r := row(<C>, <K>)

Bind r to the output row(<C>, <K>) in turn. The number of repetition of the * construct is the number of rows in the output.

d. ...? ---> ...? :f(T.C(r), n)

The output domain of f() is {0,1}. The output value determine the whether the construct inside the "?" construct occurs once or does not occur.

e. (x1x2...xn) ==> (x1x2...xn) :f(T.C(r), n)

The output domain.of f() is {1,2,...,n. The output value determines which of the alternatives to take.

f. <!ELEMENT E (....)> ==> <!ELEMENT E (...)> ::r := row(<C>,<K>)

binding the row variable r to the output of row(<C>, <K>). If row(<C>, <K>) output more than one rows, r is bound to them in turn. And the content of the construct is a sequence of elements E

Binding rule:

Variables of the same name may appear in various places in a DTD-SA. They may or may not bind to the same value. It is therefore necessary to define the binding rules clearly. There are two types of unbound variables in a DTD-SA, row variables, and integer variables used in determining repetition and alternatives selection.

Distance rules for content and binding specifications:

1. For two specs s1 and s2 in the same annotated definition, s1 is an ancestor spec of s2 if s2 is followed, among other symbols, by some number of ")" then by s1, in the annotated definition.
2. If s1 and s2 are both ancestor specs of s3 in the same annotated definition, s1 is closer to s3 then s2, if the number of ")" between s1 and s3 is less.
3. If s1 is defined in annotated definition e1, and s2 defined is annotated definition e2. s2 is an ancestor spec of s1 if e2 is an ancestor annotated definition of e1.
4. An ancestor spec in the same annotated definition is always closer to an ancestor spec in an ancestor annotated definition.
5. If e1 and e2 are ancestor annotated definitions of definition e3, and s1, s2 and s3 are defined inside e1, e2, and e3 respectively. s1 is closer to s3 then s2, if e1 is closer to e3 then e2.

Binding rules for row variables

6. A row variable r binds to the closest ancestral row binding specification with the same left-hand side (i.e. :: r:= ...).

Binding rules for integer variable

7. An integer variable n binds to the closest ancestor integer binding specification with the same left-hand side (i.e. :: n:= ...)

How to Access an XML Document using DTD-SA?

To retrieve an XML document using a DTD-SA, one or more row variable bindings must be supplied to the root element, so that all unbound variables in the descent elements and

attributes are bound.
XML retrieval
To access an XML document,
1. (necessary only is DTD-SA system, not needed for single DTD-SA)
Select an element as root element.
2. Supply a "r:= row(<C>, <K>)" to the root element.
Everything else will follow through naturally.

Mixing XML data and raw data:
One great advantage of this method is that the data retrieved from the database can be in either raw format or XML format. The above discussion already explains how data in raw format can be retrieved and put into XML format.
A field in a database table can have either raw (non-XML) data or XML data. Our framework handles both case smoothly. To incorporate data field with XML formatted data, we introduce the two addition DTD-SA specification rules:

DTD construct	DTD-SA construct	requirement
<!ELEMENT E (....)>	<!ELEMENT E (...)> :F<Cout>(r, n)	may
<!ATTLIST E A (....)>	<!ATTLIST E A(...)> :F<Cout>(r, n)	may

The rule for element E means the content of the element E will be replaced by the output of F(), which may contain XML tags. The content of the output of F() is subject to the usual XML parsing and syntax checks. Similar semantics applies to the rule for attribute A.

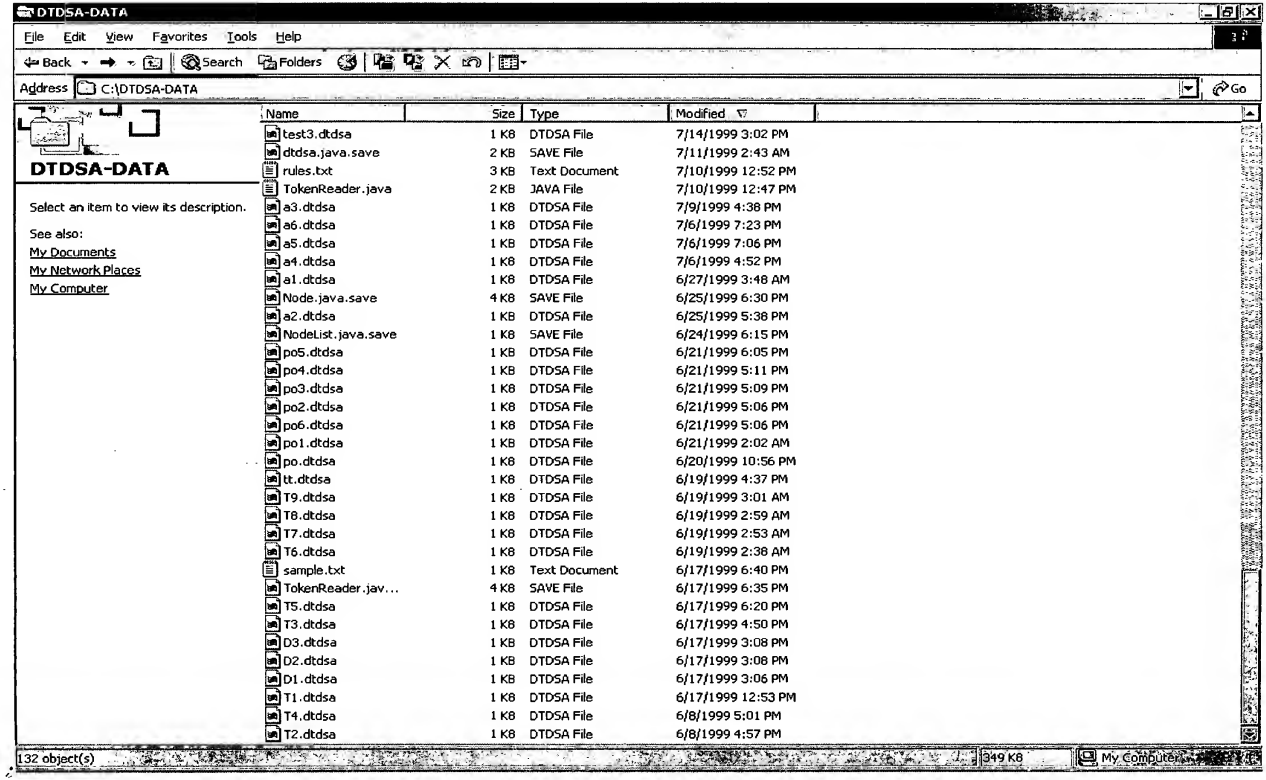
3. If the same advantage or problem has been identified by others (inside/outside IBM), how have those others solved it and does your solution differ and why is it better?

Comparison with related approaches
There have not been prior inventions related to mappings between XML DTD and relational schema. We therefore compare our invention with the following intuitively conceivable approaches.

Without such a framework for creating mapping between XML DTD and relational schema, there can be the following approaches:
1. For each relational table, assign a default DTD based on the schema of the table. Such an approach is too inflexible. If the DTD is not exactly what the application need, more work is require to convert the DTD to the desired one. Also a DTD is limited to a single table.
2. Issue SQL command, and translate the result to XML format. Again the result format is not flexible enough and has only limited usefulness.
3. Write a potentially complicated SQL program to access the relational database, then fill

the elements of the requested document with the data. The SQL can be complicated, and the logic for filling XML document elements is ad hoc and hardwired in the program.

Exhibit C


DTDSA-DATA
File Edit View Favorites Tools Help
Back Search Folders
Address C:\DTDSA-DATA
Go
DTDSA-DATA
Select an item to view its description.
See also:
My Documents
My Network Places
My Computer
Name Size Type Modified
test3.dtdsa 1 KB DTDSA File 7/14/1999 3:02 PM
dtdsa.java.save 2 KB SAVE File 7/11/1999 2:43 AM
rules.txt 3 KB Text Document 7/10/1999 12:52 PM
TokenReader.java 2 KB JAVA File 7/10/1999 12:47 PM
a3.dtdsa 1 KB DTDSA File 7/9/1999 4:38 PM
a6.dtdsa 1 KB DTDSA File 7/6/1999 7:23 PM
a5.dtdsa 1 KB DTDSA File 7/6/1999 7:06 PM
a4.dtdsa 1 KB DTDSA File 7/6/1999 4:52 PM
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Node.java.save 4 KB SAVE File 6/25/1999 6:30 PM
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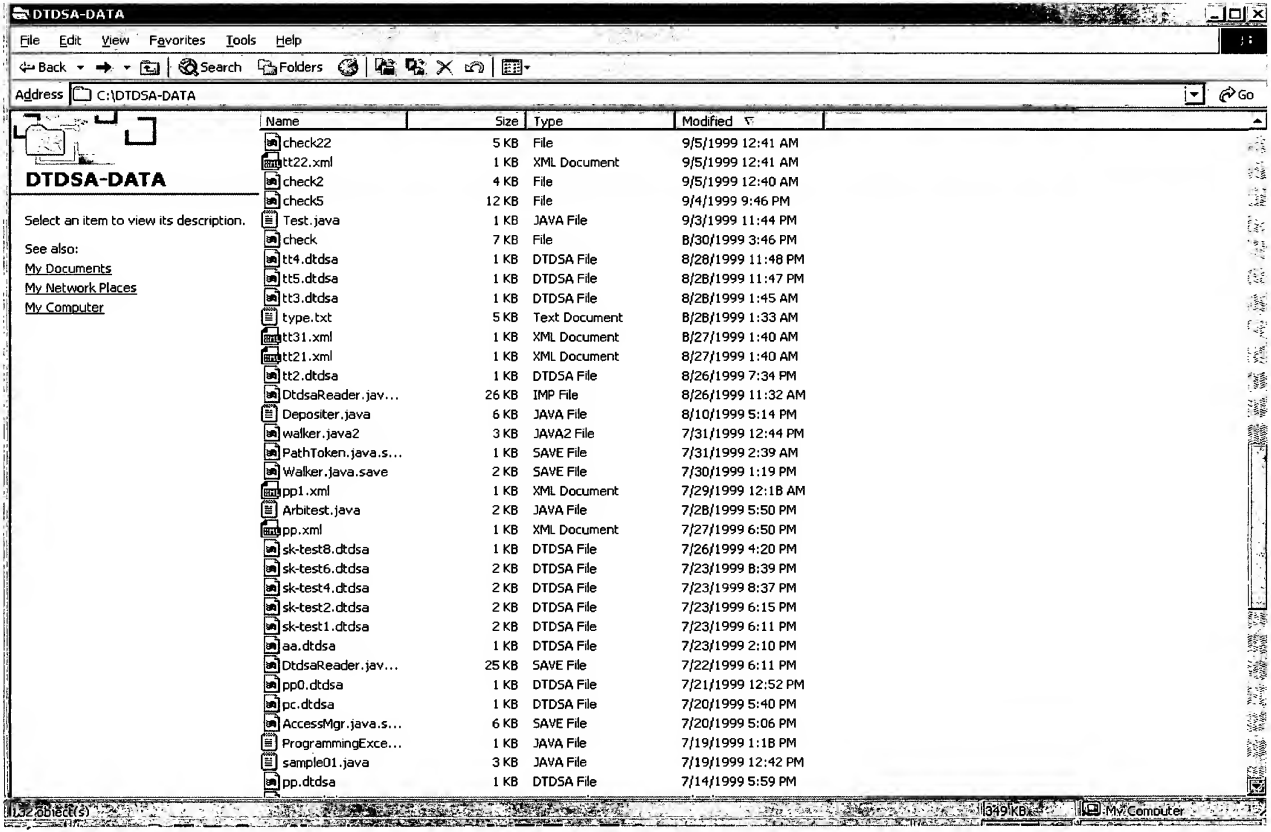
po5.dtdsa 1 KB DTDSA File 6/21/1999 6:05 PM
po4.dtdsa 1 KB DTDSA File 6/21/1999 5:11 PM
po3.dtdsa 1 KB DTDSA File 6/21/1999 5:09 PM
po2.dtdsa 1 KB DTDSA File 6/21/1999 5:06 PM
po6.dtdsa 1 KB DTDSA File 6/21/1999 5:06 PM
po1.dtdsa 1 KB DTDSA File 6/21/1999 2:02 AM
po.dtdsa 1 KB DTDSA File 6/20/1999 10:56 PM
tt.dtdsa 1 KB DTDSA File 6/19/1999 4:37 PM
T9.dtdsa 1 KB DTDSA File 6/19/1999 3:01 AM
T8.dtdsa 1 KB DTDSA File 6/19/1999 2:59 AM
T7.dtdsa 1 KB DTDSA File 6/19/1999 2:53 AM
T6.dtdsa 1 KB DTDSA File 6/19/1999 2:38 AM
sample.txt 1 KB Text Document 6/17/1999 6:40 PM
TokenReader.jav... 4 KB SAVE File 6/17/1999 6:35 PM
T5.dtdsa 1 KB DTDSA File 6/17/1999 6:20 PM
T3.dtdsa 1 KB DTDSA File 6/17/1999 4:50 PM
D3.dtdsa 1 KB DTDSA File 6/17/1999 3:08 PM
D2.dtdsa 1 KB DTDSA File 6/17/1999 3:08 PM
D1.dtdsa 1 KB DTDSA File 6/17/1999 3:06 PM
T1.dtdsa 1 KB DTDSA File 6/17/1999 12:53 PM
T4.dtdsa 1 KB DTDSA File 6/8/1999 5:01 PM
T2.dtdsa 1 KB DTDSA File 6/8/1999 4:57 PM
132 object(s)
349 KB
My Computer


DTDSA-DATA
File Edit View Favorites Tools Help
Back Search Folders
Address C:\DTDSA-DATA
Go
DTDSA-DATA
Select an item to view its description.
See also:
My Documents
My Network Places
My Computer
Name Size Type Modified
check22 5 KB File 9/5/1999 12:41 AM
tt22.xml 1 KB XML Document 9/5/1999 12:41 AM
check2 4 KB File 9/5/1999 12:40 AM
check5 12 KB File 9/4/1999 9:46 PM
Test.java 1 KB JAVA File 9/3/1999 11:44 PM
check 7 KB File 8/30/1999 3:46 PM
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tt5.dtdsa 1 KB DTDSA File 8/28/1999 11:47 PM
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type.txt 5 KB Text Document 8/28/1999 1:33 AM
tt31.xml 1 KB XML Document 8/27/1999 1:40 AM
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tt2.dtdsa 1 KB DTDSA File 8/26/1999 7:34 PM
DtdsaReader.jav... 26 KB IMP File 8/26/1999 11:32 AM
Depositer.java 6 KB JAVA File 8/10/1999 5:14 PM
walker.java2 3 KB JAVA2 File 7/31/1999 12:44 PM
PathToken.java.s... 1 KB SAVE File 7/31/1999 2:39 AM
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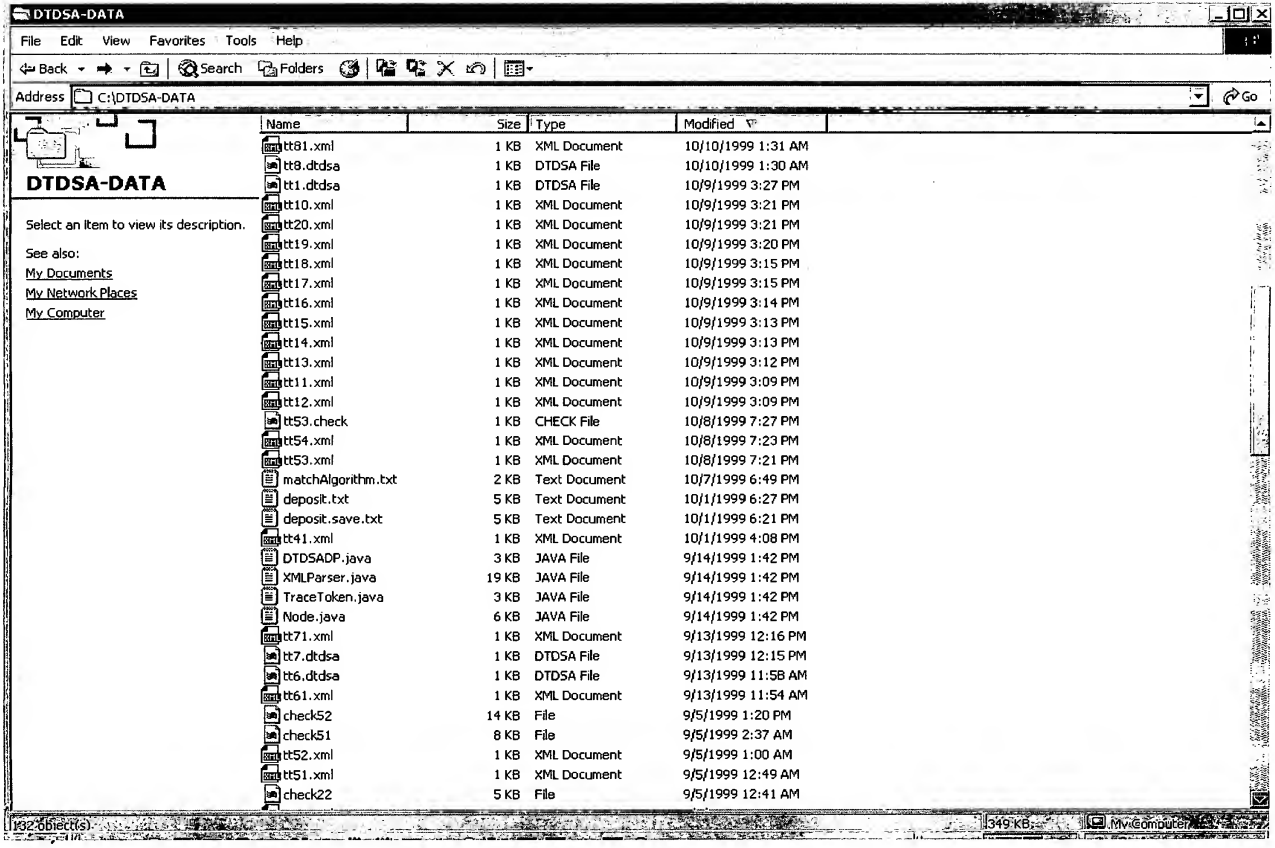
Arbitest.java 2 KB JAVA File 7/28/1999 5:50 PM
pp.xml 1 KB XML Document 7/27/1999 6:50 PM
sk-test8.dtdsa 1 KB DTDSA File 7/26/1999 4:20 PM
sk-test6.dtdsa 2 KB DTDSA File 7/23/1999 8:39 PM
sk-test4.dtdsa 2 KB DTDSA File 7/23/1999 8:37 PM
sk-test2.dtdsa 2 KB DTDSA File 7/23/1999 6:15 PM
sk-test1.dtdsa 2 KB DTDSA File 7/23/1999 6:11 PM
aa.dtdsa 1 KB DTDSA File 7/23/1999 2:10 PM
DtdsaReader.jav... 25 KB SAVE File 7/22/1999 6:11 PM
pp0.dtdsa 1 KB DTDSA File 7/21/1999 12:52 PM
pc.dtdsa 1 KB DTDSA File 7/20/1999 5:40 PM
AccessMgr.java.s... 6 KB SAVE File 7/20/1999 5:06 PM
ProgrammingExce... 1 KB JAVA File 7/19/1999 1:18 PM
sample01.java 3 KB JAVA File 7/19/1999 12:42 PM
pp.dtdsa 1 KB DTDSA File 7/14/1999 5:59 PM
32 object(s)
349 KB
My Computer


DTDSA-DATA
File Edit View Favorites Tools Help
Back Search Folders
Address C:\DTDSA-DATA
Go
DTDSA-DATA
Select an item to view its description.
See also:
My Documents
My Network Places
My Computer
Name Size Type Modified
tt81.xml 1 KB XML Document 10/10/1999 1:31 AM
tt8.dtdsa 1 KB DTDSA File 10/10/1999 1:30 AM
tt1.dtdsa 1 KB DTDSA File 10/9/1999 3:27 PM
tt10.xml 1 KB XML Document 10/9/1999 3:21 PM
tt20.xml 1 KB XML Document 10/9/1999 3:21 PM
tt19.xml 1 KB XML Document 10/9/1999 3:20 PM
tt18.xml 1 KB XML Document 10/9/1999 3:15 PM
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tt15.xml 1 KB XML Document 10/9/1999 3:13 PM
tt14.xml 1 KB XML Document 10/9/1999 3:13 PM
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tt11.xml 1 KB XML Document 10/9/1999 3:09 PM
tt12.xml 1 KB XML Document 10/9/1999 3:09 PM
tt53.check 1 KB CHECK File 10/8/1999 7:27 PM
tt54.xml 1 KB XML Document 10/8/1999 7:23 PM
tt53.xml 1 KB XML Document 10/8/1999 7:21 PM
matchAlgorithm.txt 2 KB Text Document 10/7/1999 6:49 PM
deposit.txt 5 KB Text Document 10/1/1999 6:27 PM
deposit.save.txt 5 KB Text Document 10/1/1999 6:21 PM
tt41.xml 1 KB XML Document 10/1/1999 4:08 PM
DTDSADP.java 3 KB JAVA File 9/14/1999 1:42 PM
XMLParser.java 19 KB JAVA File 9/14/1999 1:42 PM
TraceToken.java 3 KB JAVA File 9/14/1999 1:42 PM
Node.java 6 KB JAVA File 9/14/1999 1:42 PM
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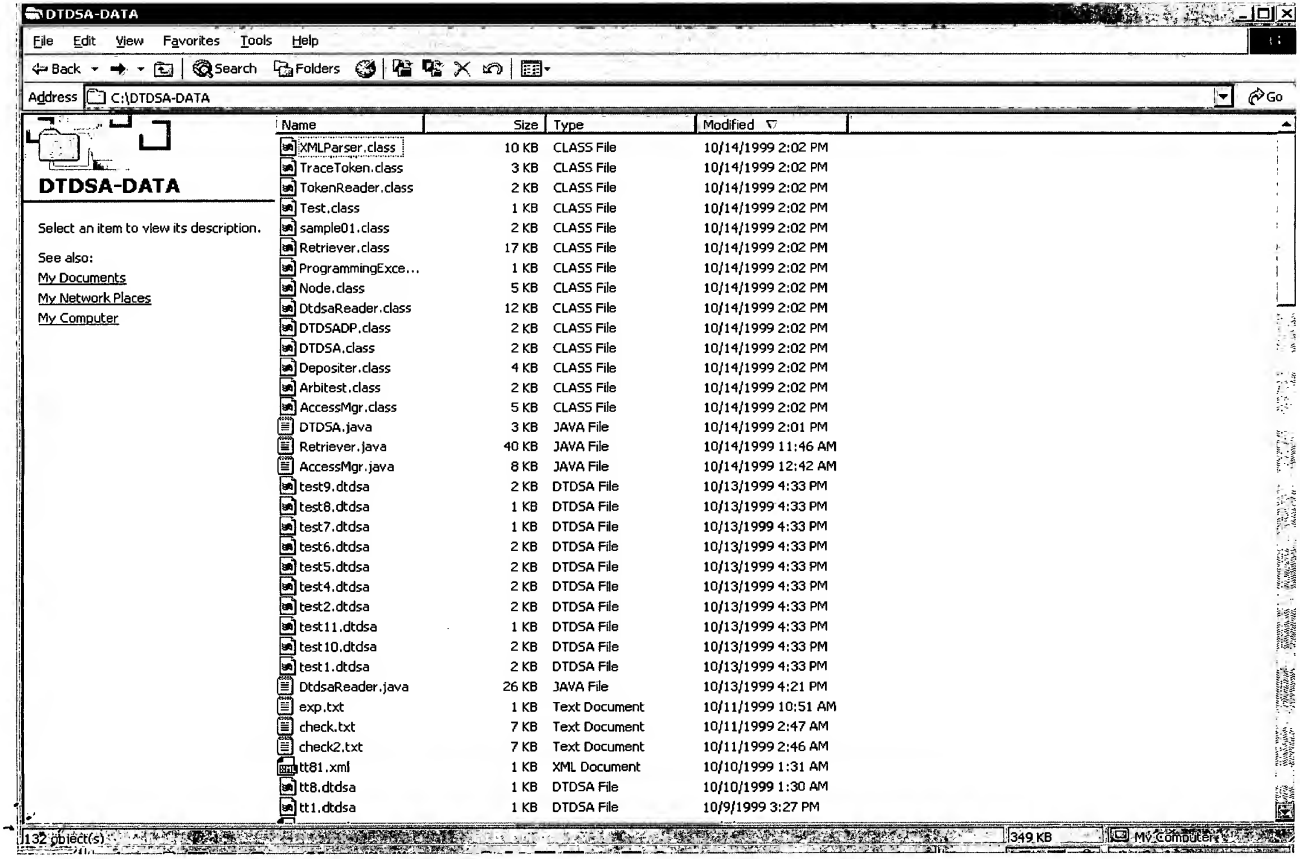
tt7.dtdsa 1 KB DTDSA File 9/13/1999 12:15 PM
tt6.dtdsa 1 KB DTDSA File 9/13/1999 11:58 AM
tt61.xml 1 KB XML Document 9/13/1999 11:54 AM
check52 14 KB File 9/5/1999 1:20 PM
check51 8 KB File 9/5/1999 2:37 AM
tt52.xml 1 KB XML Document 9/5/1999 1:00 AM
tt51.xml 1 KB XML Document 9/5/1999 12:49 AM
check22 5 KB File 9/5/1999 12:41 AM
132 object(s)
349 KB
My Computer


DTDSA-DATA
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DTDSA-DATA
Select an item to view its description.
See also:
My Documents
My Network Places
My Computer
Name Size Type Modified
XMLParser.class 10 KB CLASS File 10/14/1999 2:02 PM
TraceToken.class 3 KB CLASS File 10/14/1999 2:02 PM
TokenReader.class 2 KB CLASS File 10/14/1999 2:02 PM
Test.class 1 KB CLASS File 10/14/1999 2:02 PM
sample01.class 2 KB CLASS File 10/14/1999 2:02 PM
Retriever.class 17 KB CLASS File 10/14/1999 2:02 PM
ProgrammingExce... 1 KB CLASS File 10/14/1999 2:02 PM
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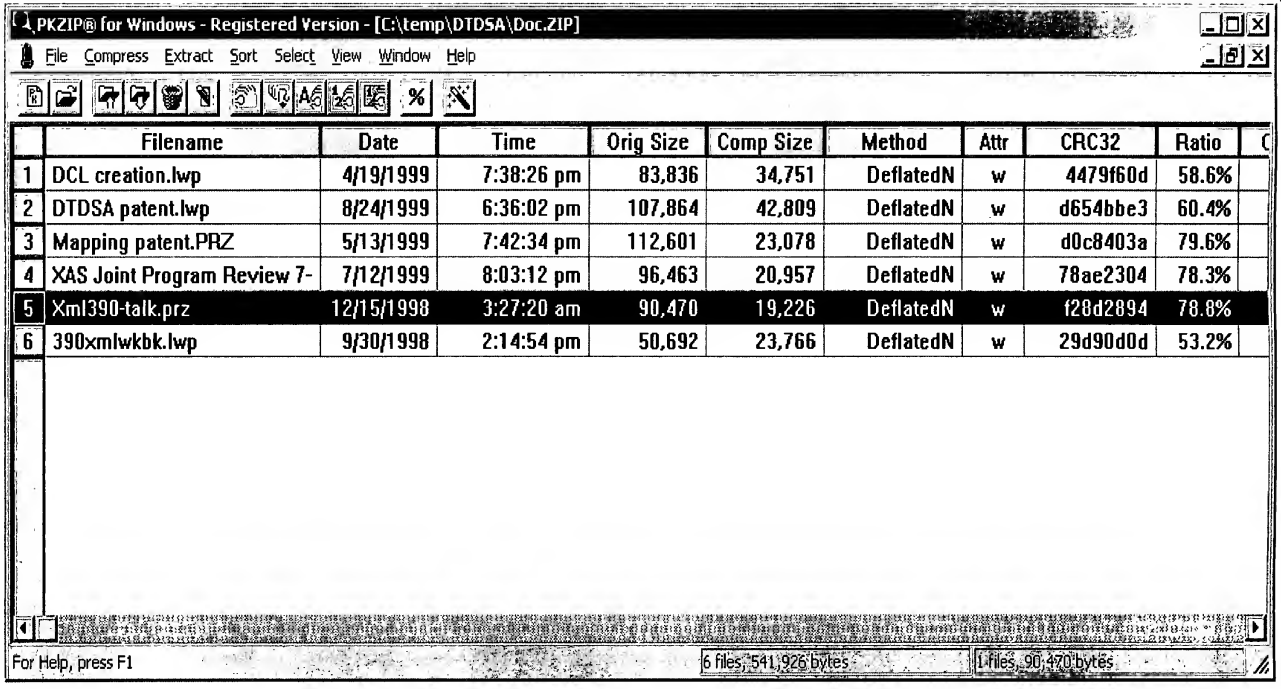
DTDSADP.class 2 KB CLASS File 10/14/1999 2:02 PM
DTDSA.class 2 KB CLASS File 10/14/1999 2:02 PM
Depositer.class 4 KB CLASS File 10/14/1999 2:02 PM
Arbitest.class 2 KB CLASS File 10/14/1999 2:02 PM
AccessMgr.class 5 KB CLASS File 10/14/1999 2:02 PM
DTDSA.java 3 KB JAVA File 10/14/1999 2:01 PM
Retriever.java 40 KB JAVA File 10/14/1999 11:46 AM
AccessMgr.java 8 KB JAVA File 10/14/1999 12:42 AM
test9.dtdsa 2 KB DTDSA File 10/13/1999 4:33 PM
test8.dtdsa 1 KB DTDSA File 10/13/1999 4:33 PM
test7.dtdsa 1 KB DTDSA File 10/13/1999 4:33 PM
test6.dtdsa 2 KB DTDSA File 10/13/1999 4:33 PM
test5.dtdsa 2 KB DTDSA File 10/13/1999 4:33 PM
test4.dtdsa 2 KB DTDSA File 10/13/1999 4:33 PM
test2.dtdsa 2 KB DTDSA File 10/13/1999 4:33 PM
test11.dtdsa 1 KB DTDSA File 10/13/1999 4:33 PM
test10.dtdsa 2 KB DTDSA File 10/13/1999 4:33 PM
test1.dtdsa 2 KB DTDSA File 10/13/1999 4:33 PM
DtdsaReader.java 26 KB JAVA File 10/13/1999 4:21 PM
exp.txt 1 KB Text Document 10/11/1999 10:51 AM
check.txt 7 KB Text Document 10/11/1999 2:47 AM
check2.txt 7 KB Text Document 10/11/1999 2:46 AM
tt81.xml 1 KB XML Document 10/10/1999 1:31 AM
tt8.dtdsa 1 KB DTDSA File 10/10/1999 1:30 AM
tt1.dtdsa 1 KB DTDSA File 10/9/1999 3:27 PM
132 object(s)
349 KB
My Computer



	Filename	Date	Time	Orig Size	Comp Size	Method	Attr	CRC32	Ratio
1	DCL creation.lwp	4/19/1999	7:38:26 pm	83,836	34,751	DeflatedN	w	4479f60d	58.6%
2	DTDSA patent.lwp	8/24/1999	6:36:02 pm	107,864	42,809	DeflatedN	w	d654bbe3	60.4%
3	Mapping patent.PRZ	5/13/1999	7:42:34 pm	112,601	23,078	DeflatedN	w	d0c8403a	79.6%
4	XAS Joint Program Review 7-	7/12/1999	8:03:12 pm	96,463	20,957	DeflatedN	w	78ae2304	78.3%
5	Xml390-talk.prz	12/15/1998	3:27:20 am	90,470	19,226	DeflatedN	w	f28d2894	78.8%
6	390xmlwkbk.lwp	9/30/1998	2:14:54 pm	50,692	23,766	DeflatedN	w	29d90d0d	53.2%

Exhibit D